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Contents

Deep Conflicts Stir Engineers at Detroit With Visitors Scoring. By Norman G. Shidle 179

Up From 1925, Flexible Engine Mountings Progress to Damping of Torsional as Well as Reciprocatory Vibration. By P. M. Heldt... 184

Just Among Ourselves 189

Non-Productive Workers Share in Norton Wage Plan. By Joseph Geschelin 190

Kelsey Achieves Fused Weldless Brake Drum.. 194

Bendix Metal Tubing 197

Big Gross Ratings on Autocar Lorries 198

Production Lines 199

Automotive Oddities 200

News of the Industry 201

Calendar of Coming Events 208

New Developments 210

Advertisers' Index 62-63

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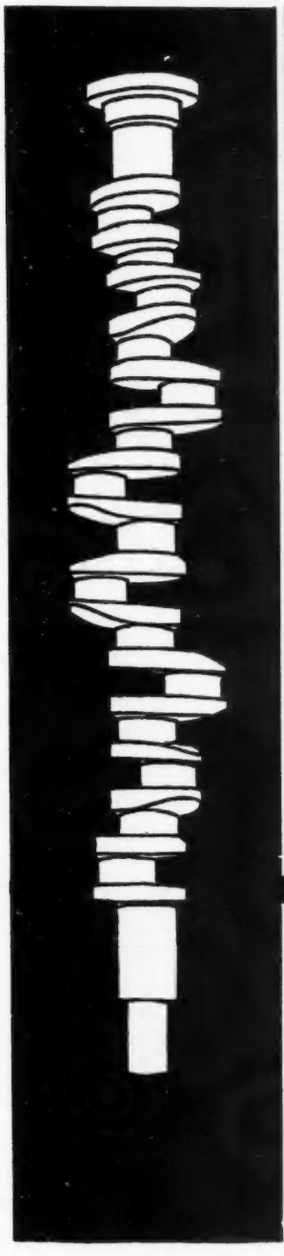

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AUTOMOTIVE INDUSTRIES
VOLUME 66 FEBRUARY 6, 1932 NUMBER 6

Deep Conflicts Stir Engineers at Detroit With Visitors Scoring

by Norman G. Shidle

Sir Dennistoun Burney, British designer of the airship R-100 and authority on aerodynamics, was a headliner. Said Sir Dennistoun: "I believe the new conditions will evolve a new overall design which will, in time, be found superior to any other, and will become the orthodox car of the future."

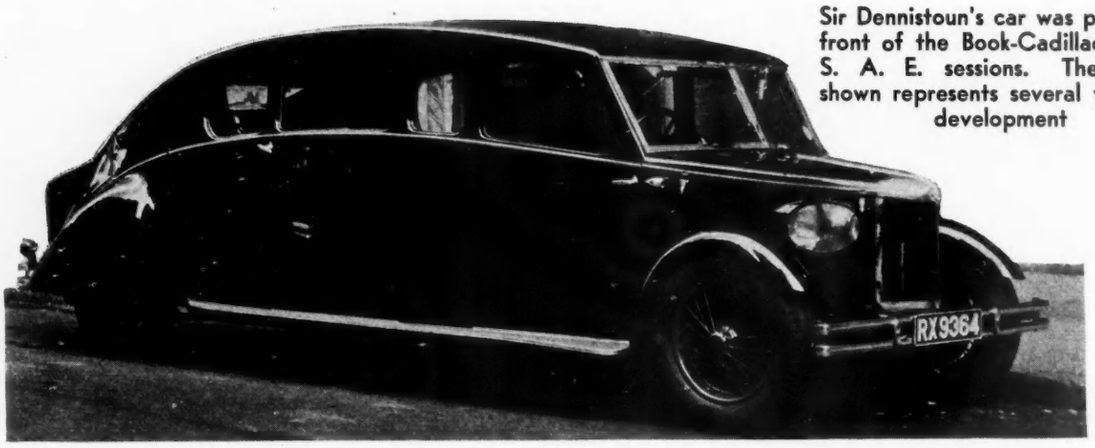
"THE automobile industry is a private in the rear rank in the big parade of modern science-aided industries. The moving picture of research in the automotive industry appears to be a 'talkie.' It is mostly concerned with sound effects—with little or no action."

Thus was the automobile industry flayed by Maurice Holland of the National Research Council at the Annual Meeting of the Society of Automotive Engineers held in Detroit, Jan. 25-29.

Because they won't obey aerodynamic laws in design of automobiles, American manufacturers are foisting on American motorists a yearly waste of not less than $500,000,000, the engineers were told by another speaker, Sir Dennistoun Burney, British designer of aircraft, watercraft and streamlined automobiles.

Besides listening to these sharp criticisms from outsiders, the engineers were busy during the entire week arguing with each other about the best ways to accomplish both the detailed and radical changes which most of them seem to agree are going to come about in American motor vehicles within the next few years.

Stirring. Stimulating. Vital. These are the only words which can express with any accuracy this greatest of all annual meetings of the society. In attendance it topped all records of recent years. Not only did engineers come in larger numbers than usual, but the importance of the executives participating in the dis-



Sir Dennistoun's car was parked in front of the Book-Cadillac during S. A. E. sessions. The model shown represents several years of development

cussions was greater as well. Frankness and crispness characterized the proceedings and the expressions of opinion at almost every session and every committee meeting. Truly, the Society of Automotive Engineers seems to be reaching new heights as a forum of practical engineering ideas.

A majority of the technicians who listened to the outside critics quoted above seemed antagonistic to the lashing given their industry and their efforts, particularly by Mr. Holland, yet there was clear evidence throughout the meetings in which the engineers themselves participated that much more radical developments are expected in the next two years than have been evidenced in the last two.

The sessions and committee meetings at which sharp arguments developed furnish pertinent examples of the vitality of engineering thinking in the industry today. Starting with the first day of the convention, let's run over some of these developments briefly, before going into the details of individual discussions:

1. The front wheel alignment sub-committee of the Research Committee—which has been functioning since 1928—brought in a report which showed among other things that more than one-half of the cars tested did not meet manufacturer's specifications of toe-in, camber, castor and steering knuckle pivot inclination.

It brought out, too, that much of the equipment for measuring these elements is still far from satisfactory —and thus precipitated a violent, yet clarifying, difference of opinion among engineers and equipment manufacturers.

The discussion which followed showed definitely that many important questions in this field still remain to be answered, and that there is need for a good deal of further work by the committee.

2. Prospects of an armistice appeared in the 12 months' battle between vehicle factory engineers on the one hand and the oil company and Bureau of Standards technicians on the other as regards determination of the limiting factor in bearing operation.

The factory men have advocated use of the PV factor (pressure times velocity); the oil group has fought for the $\frac{Z\,N}{P}$ formula.

O. C. Bridgeman of the Bureau of Standards was instrumental in bringing about something like agreement between the factions with a formula which reads:

$$H = PV \times \left[a + b \frac{D}{c} \left(\frac{Z\,N}{P} \right) \right] LD$$

where H is horsepower, D is the diameter of the bearing, c the clearance and L the length of the bearing.

3. Definite activity on the part of truck manufacturers to provide operators and service stations with repair and junking standards was portended in the comments by truck factory engineers following the reading of a paper on this subject, and by the strong insistence of several large fleet operators that some real activity along this line be undertaken by individual factories.

4. Surface indications of deep conflict of opinion among various truck company engineers about the U. S. Army military motor transport program cropped up in the session at which Col. E. S. Stayer of the U. S. Army talked about powerplants and their relation to military motor transport; and these indications of conflict became definitely more pronounced in the meeting of the Military Motor Transport Advisory Committee of the S.A.E. which followed.

Technical and commercial history on this subject began to be written with the development of the Class B truck during the War and, if informal ideas expressed during this meeting are any indication, much more will be written before anything like general agreement is reached, even within the industry itself.

5. In the field of riding comfort, the practical possibilities of really quantitative determination of comfort were vividly shown by the results of new tests made by Dr. F. A. Moss with the now well-known wabblemeter. Tests of pilots and passengers on the Ludington airline between New York and Washington, Dr. Moss said, showed an increase in wabble at the end of the flight of 42 per cent in pilots as compared with before starting the flight; in passengers the increase was 77 per cent. Tests of a small group before and after a long sailboat ride, on the other hand, showed a slight decrease in wabble in the case of each member of the group.

Further quantitative tests of riding comfort and driving reactions were forecast by the announcement of the development of a visiometer, designed to measure eye reactions in driving, and a reaction timer which will measure the time it takes to get the foot from the accelerator to the brake pedal.

Argument on riding comfort developed chiefly in difference of opinion between W. S. James of Studebaker and Tore Franzen of Chrysler following the presentation of Mr. James' paper describing the principles underlying the new Houdaille-Studebaker automatic shock absorber development.

6. Sharp technical argument developed, also, as regards the proper method of approach in testing Diesel engine fuels from the standpoint of compression-ignition characteristics.

7. What had promised to be a meeting to ratify a standard method of motor truck rating, turned out to be brisk battle of conflicting interests and opinion when the motor truck rating committee met. But before the arguments were over, most of the past work of the committee had been saved and future agreement brought once again within sight. There is strong evidence to indicate that committee approval of a standard rating will be obtained in time to permit presentation of the rating for Standards Committee action at the summer meeting this year.

8. At the final session on Friday morning, O. C. Bridgeman brought amplified data on his long series of vapor lock tests, and defined the relative vapor locking characteristics of gravity, vacuum tank and fuel pump systems.

Just as competition is the life of trade, so is difference of opinion the life blood of engineering progress. Judged by this standard, the annual meeting this year rates high, as is indicated by the foregoing paragraphs.

Aside from these important controversies on which progress was made, the outstanding event of the meeting unquestionably was the huge student meeting held on the opening night. Nearly 1000 students and 300 or 400 engineers packed every nook and corner of the big Book-Cadillac ballroom at this session to hear H. L. Horning, past president of the society and president of Waukesha Motor Co., talk on "The Theory of Internal Combustion Engines and Fuels." This session was sponsored by the Detroit Section Student Activity and was presided over by Robert N. Janeway who heads that activity.

H. L. Horning

Waukesha

A past-president of the Society lectured to more than 1000 students on "The Theory of Internal Combustion Engines and Fuels." The session on Monday at which he spoke was sponsored by the Detroit Section Student Activity

The main topic of Mr. Horning's talk was the difference between success and failure in a general commercial engine design. This difference, he said, "lies in the battle of a 1000th of an inch." The successful engineering executive, he continued, is the one who is capable of organizing his staff in such a manner that every one of the hundreds or thousands of small details involved will be properly taken care of.

Although it is out of place in a strictly news report, the writer cannot refrain from emphasizing here the tremendous importance of this gathering to the future of S.A.E. activities—nor can he refrain from expressing the high praise heard on all sides at the work done in this development by Alex Taub, now chairman of the Detroit Section, under whose leadership the student activity first took form, and Mr. Janeway, who is now carrying on the work under Mr. Taub's administration.

R. N. Janeway

Chrysler

Mr. Janeway was chairman of the student meeting and was co-author of a paper on "A New Type of Engine Mounting" presented at the Chassis Session on Tuesday

Speaking from what appeared to be a strictly research point of view—a point of view which, in the opinion of many engineers, lacks much in breadth of vision and economic concept—Mr. Holland branded the automotive industry as a parasite on the research of other industries and ridiculed both the size and results of the research work of this largest of manufacturing industries.

Seldom has any speaker stuck out more forcefully or more wildly in condemning the efforts of the automotive industry than did Mr. Holland in his talk at the big dinner held on Thursday night.

After making a strong plea for cooperative research work in general and after citing examples of how such research has been and is benefiting other industries, Mr. Holland took off his rhetorical gloves and started in to slug the automotive industry with bare fists.

He admitted that several large automobile companies have excellent private laboratories, but condemned most automotive research activity as consisting of "development, testing and 'trouble shooting' departments going highbrow, with that much abused name, research." He stated—apparently as a criticism—that Ph.D.'s are as rare in these departments as horseflies in Detroit.

"In the last analysis," Mr. Holland said, "the present-day automobile is a research assembly job. The 1932 model with its new finery is a dressed up modern girl, running around on a chassis not radically different from those of the Gay Nineties."

Then he went on to picture his conception of the 1940 automobile as follows:

"I seem to see a low, streamlined model, representing the dynamic power that propels it, perhaps by sources of energy and mechanisms unknown today.

"That 1940 model can be operated by a child with perhaps a single lever, and its speed controlled by a deft touch of the hand. Hardly a vestige of the old-fashioned 1930 model remains, the days reminiscent

R. K. Lee
Chrysler

Mr. Lee was one of the authors of the paper on "A New Type of Engine Mounting," given at the Chassis Session on Tuesday, Jan. 26

of the times when every operator had to be a mechanical engineer and an acrobat.

"How is this to be brought about? The same modern magicians who transformed that 1920 model to the present-day car, working with the tools of research will produce an automobile for the customer of 1940 which will be as much or more of an advance than has been made in the last decade."

Sir Dennistoun Burney, who brought with him to this country one of his rear-engined streamlined cars, challenged current practice in automobile design in many respects, explaining in detail the design principles which he followed in the construction of the car which now bears his name.

Particularly he emphasized his belief that a weight distribution of two-thirds in the rear and one-third in the front is the most desirable, as opposed to the usual fifty-fifty weight distribution common to current front-engined cars.

Streamlined cars with engines in the front are perfectly possible, he stated, but voiced his conviction that streamlining cannot be obtained with the engine in the front without carrying with it great waste of space and other disadvantages.

Sir Dennistoun believes that the rear-engined car is safer than the conventional vehicle in case of an accident. The "rate of crumple" of the front can be made slow enough in rear-engined cars to provide greater safety to passengers in case of front-end collision than is possible with the engine in front, because of the rigidity of the engine itself. He prefers water to air-cooled engines in rear-engined cars, he said, because they provide an easy means for supplying heat for warming the body.

Truck Rating Brings Out New Proposal by Horine

IT has been a year now since the S. A. E. committee on motor truck rating began its deliberations. In December, as a result of the Washington meeting of the committee reported in these columns, it looked as if the three-part rating, representing gross vehicle weight, grade ability and rated or guaranteed speed would be adopted at the annual meeting session of this committee.

The session had barely started, however, when evidence was brought forth that a number of manufacturers were not in accord with the proposed rating, and there immediately developed a danger that the whole question would blow up in smoke and the committee would have to start all over again. Only masterful handling of the session by L. R. Buckendale, chairman of the committee, and the very evident desire on the part even of those who most violently opposed the suggested rating method to cooperate to the fullest extent with other members of the committee prevented the entire collapse. As the matter now stands, however, even the question of whether the three-figure rating suggested by A. G. Herreshoff at the Washington meeting will be adopted is in doubt, in spite of the fact that the committee tentatively adopted this method of rating in Washington, and at the most recent session also developed and approved a grade ability formula for use with this rating method if and when it should be adopted.

This grade ability formula is not new, having been used for some time by a number of truck manufacturers and operators and originally developed by C. T. Myers, a number of years ago. As this formula was finally developed it would read as follows:

$$GF = Grade\ in\ per\ cent = \frac{100T \times 12 \times e \times R}{r \times GVW} - RF$$

Where T is the engine torque in pounds-feet, obtained by multiplying the piston displacement of the engine by 0.625

R is the gear reduction

r is the rolling radius of the driving tires in inches at rated capacity

In this formula the efficiency (e) from engine to tires is to be averaged at 90 per cent and road rolling resistance (RF) has been selected at 1.5 per cent to represent average conditions.

The Herreshoff-Buckendale proposed rating, therefore, has reached a point where in itself it is complete and has its various details approved by the committee. The question remains whether or not it is going to be used.

Merrill C. Horine of International Motor Co. then offered a counter-proposal, also involving a three-factor rating but of different character. It was Mr. Horine's contention that the first figure in the rating should represent the gross load ability of the truck in question, that the second figure should represent the gross vehicle weight and the third figure a "performance factor," which, by simple calculation, could be made to give up the secret of the grade ability of the truck, etc.

Mr. Horine's performance factor is based on the

grade ability formula mentioned above, so that even if Mr. Horine's suggestion is adopted, the work of the committee will not have been wasted. The session ended with the agreement that the Herreshoff plan as now constituted be drawn up as an S. A. E. recommended practice, and Mr. Horine and other members of the committee draw up similar recommended practices and that all of these be disseminated to members of the committee before the next gathering at the summer meeting of the Society at White Sulphur Springs in the spring.

As was to be expected, the motor coach and motor truck session developed the customary arguments between the proponents of small and large engines. Both papers at this meeting, one by Col. E. S. Stayer of the United States Army on "Powerplants and Their Relation to the Military Motor Transport of the Army," and the second by Hubert Walker, American LaFrance and Foamite Corp., on "The Super Range V-12 Engine for Modern Transportation," emphasized the large engine.

As was to be expected also, the army again put in its plea for larger powerplants of higher output and an increase in design standardization.

Bridgeman Gave Compromise Formula on Bearing Pressures

THE Tuesday morning session on bearings developed a real hope that the two factions on the question of what is the limiting factor in bearing operation would get together. For the past year a battle has been raging between Detroit engineers on the one hand and oil company and Bureau of Standards representatives on the other, the former advocating the use of the PV factor (pressure times velocity) and the other the $\frac{ZN}{P}$ formula (oil viscosity and shearing strength of oil volume of limiting factor). To O. C. Bridgeman of the Bureau of Standards goes the major credit for bringing the two factions together with a formula reading as follows:

$$H = PV \times \left[a + b\frac{c}{d}\left(\frac{ZN}{P}\right)\right] LD$$

where H is horsepower, D is the diameter of the bearing, c the clearance and L the length of the bearing. For high values of $\frac{ZN}{P}$, Dr. Bridgeman pointed out that a becomes relatively negligible and H becomes proportional to $bz\ v^2$. For low values of $\frac{ZN}{P}$, the second factor becomes negligible and the horsepower the bearing can absorb becomes proportional to aPV.

Alex Taub, Chevrolet Motor Co., who has been one of the leaders in carrying this question forward, indicated that he was willing to accept Dr. Bridgeman's formula as a starting point. Robert N. Janeway, whose articles in *Automotive Industries* really precipitated this battle, pointed out that Dr. Barnard, who advocates perfect film lubrication theory, gave values for the factors a and b of .002 and .000018 in a paper in 1925.

Mr. Taub's and Mr. Janeway's contention, of course, is that what the motor engineer is interested in is the ragged edge, where values of $\frac{ZN}{P}$ are low. Mr. Taub said, "We are not interested in how bearings will stand up at 50 m.p.h. What we are interested in is the ragged edge where there is no perfect film lubrication. If a job fails under these conditions how are we going to extend its bearing life. We cannot afford to neglect the question of pressure, as otherwise it would be entirely possible to take Ford bearings and put them in a Diesel engine and get away with it."

Lewis Kalb, chief engineer, Continental Motors Corp., requested that any formula developed for the engine designer would eliminate reference to clearance as a variable, as otherwise he didn't believe any such formula would be of practical use.

Alex Taub
Chevrolet

Besides acting as toastmaster at the dinner given by the Detroit Section to the national organization, Mr. Taub explained "The Car Designer's Viewpoint on Engine Bearings" at the Bearings Session, Tuesday morning, Jan 26

A. F. Underwood of General Motors Research Corp. in the discussion of the various papers further pointed out that if we could be sure of perfect film lubrication there would be no need for using babbitt in bearings. The use of babbitt, he pointed out, is to provide a self-healing action for the bearing surface after a metal-to-metal contact has been established.

Three very interesting papers comprised the matter leading up to this discussion. D. P. Barnard, Standard Oil Co. of Indiana, talked on "A Possible Criterion for Bearing Temperature Stresses." Dave E. Anderson, Bohn Aluminum and Brass Corp., presented the other, or "The Manufacturers' Viewpoint on Engine Bearings." Mr. Taub's subject was "The Car Designers' Viewpoint on Engine Bearings."

(Turn to page 195, please)

Up From 1925 Flexible Engine Mountings Well as Reciprocatory Vibration

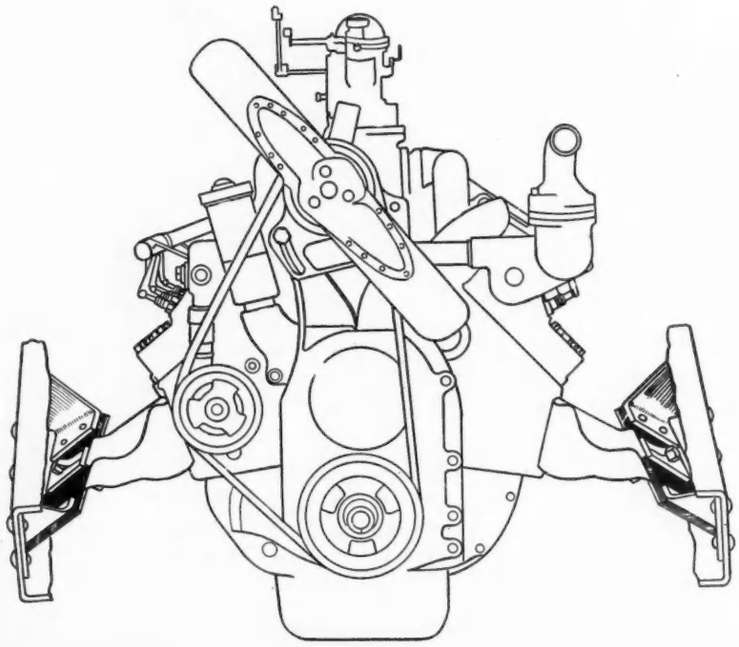
by P. M. Heldt

UP to quite recently the general principle followed in making installations of reciprocating engines was to mount them on foundations as heavy and rigid as could be conveniently provided. In the operation of all reciprocating engines certain periodic unbalanced forces are produced, and it was correctly reasoned that the larger and heavier the mass to which the engine was bolted down the smaller would be the amplitude of the vibrations resulting from these unbalanced forces. For stationary engines massive concrete foundations are generally provided, in which heavy foundation bolts are anchored, by means of which the engine is firmly bolted down. In this way it is possible to keep the amplitude of vibration of even large single-cylinder engines within tolerable limits.

Where engines or other heavy machines with high-speed unbalanced masses are installed on the upper floors of buildings the old principle of rigid connection to a heavy foundation has to be departed from, however, and in such cases the machines are now frequently installed on mats of cork or on rubber supports, which "insulate" them from the floor on which they stand. Such supports damp out especially vibrations of high frequency, which are particularly annoying to the people occupying such buildings.

In the case of motor vehicles no rigid, massive foundation is available for the engine, and this makes the vibration problem a very difficult one. In the earliest cars, with engines having only one, or at most, two cylinders, engine vibration transmitted to the body was very pronounced, especially when the car was standing at the curb or was being driven at low speed.

Vibration in automobiles is objectionable on at least three counts. If a car is standing at the curb, with the engine idling, it is a matter of general satisfaction to the owner if no signs of the engine's operation are noticeable from the outside. This complete absence of visible vibration of the car at rest is perhaps of psychological value only, but it is a characteristic that no doubt affects sales. In a general way this characteristic is more pronounced in the higher grade and more expensive cars, because of their larger number of cylinders and generally more careful balancing, and the customer naturally associates it with quality.

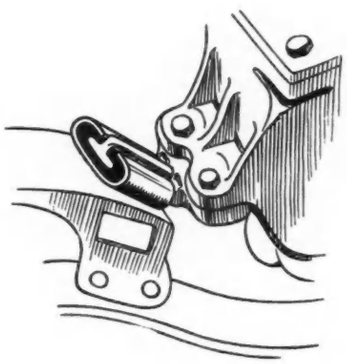


Left — Oakland eight-cylinder engine supported at forward end on laminated springs permitting a slight rocking motion

Detail of flexible front mounting of Oakland eight-cylinder engine

Progress to Damping of Torsional as

If the powerplant is supported in such a way as to be capable of a rocking motion around the axis around which it tends to turn naturally, and its rocking motion is limited by a spring with suitable damping action, the transmission of torsional vibration from the powerplant to the frame can be almost completely prevented



Rear support of Oakland eight-cylinder powerplant, rubber-insulated and fairly close to axis of gyration

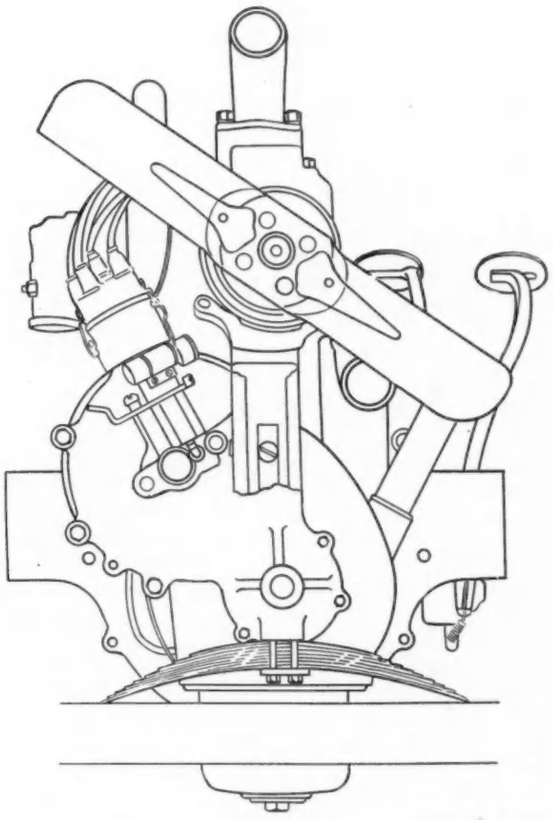
In the second place, vibration is annoying to the occupants of the car. It not only tends to lessen the enjoyment of a trip by its immediate effects, but it also has a fatiguing influence which makes itself felt only after a prolonged ride. The vibration, of course, is imparted to the bodies of the passengers, where a large part of the vibrational energy is absorbed, hence the fatigue. This, of course, applies to vibration that reaches the car body.

Finally, vibration has injurious effects on the mechanism of the car. Certain delicate parts are subjected to extra stresses by the vibration, and the cumulative effect of these vibrations, repeated millions of times, may result in eventual failure. This applies not only to vibrations reaching the body, where parts mounted on the instrument board might be affected, but to vibration of the engine as well, which carries such parts as the carburetor, ignition unit, etc.

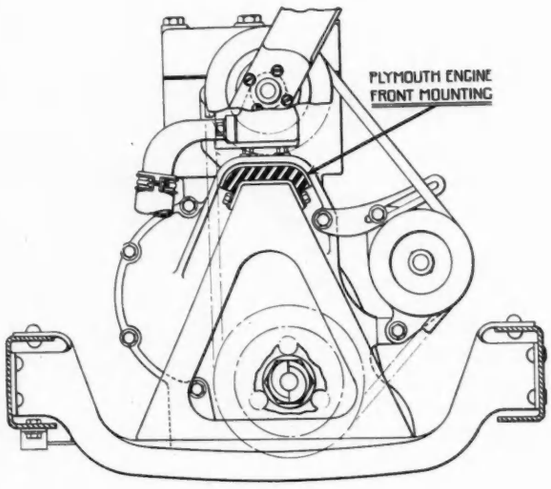
Multiplication of engine cylinders has done much to decrease engine vibration and vibration of frames and bodies induced thereby. On the other hand, increase of engine speeds, a concurrent development, has tended in the opposite direction.

The two principal causes of vibration are variations in torque reaction and unbalanced harmonics of the inertia forces. In a general way the magnitude of these causes of vibration decreases as the number of cylinders in the engine increases. The smallest number of cylinders used in American automobiles is four, and it is particularly in connection with four-cylinder engines that the problem of prevention of the transmission of engine vibration to the chassis and body arises. The problem, moreover, is not confined to private passenger cars. In buses engine vibration is often unpleasantly noticeable in the forward seats, and the general comfort of railcars could be materially improved if the transmission of engine vibration to the passengers could be prevented.

In the earlier motor vehicles the powerplant was usually rigidly bolted down to the chassis frame, for reasons already explained. If there was any flexibility in the mounting at all, as in the three-point mounting, comprising a trunnion support at the forward end, or the four-point mounting, with one supporting arm connected flexibly to the frame by placing a coiled spring under the nut of the re-



Maxwell four-cylinder engine freely supported on transverse laminated spring at forward end



Front support of Plymouth powerplant

taining bolt, the object was to prevent excessive strains on the crankcase and engine supporting arms due to distortion of the frame. Insulation of the chassis and body against engine vibration did not enter into consideration.

About 1925 the practice of mounting the powerplant on rubber pads was introduced, so-called shock insulators for the connection between the chassis springs and chassis having made their appearance some years earlier. Rubber combines the properties of elasticity and plasticity. When it is deformed by the application of a force and the force is then removed, it will not completely return to its original shape. In deforming the rubber, work is done upon it, and this work or energy is partly stored elastically and partly used up in overcoming internal friction. The part which is stored elastically is restored when the force is removed, whereas the remainder of the work is converted into heat by molecular friction within the rubber.

Rubber Engine Mountings

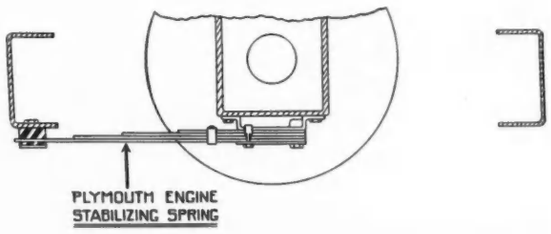
Owing to its elastic deformability, rubber is capable of absorbing vibrations of machinery mounted on it. If a machine were mounted rigidly on a floor, then at least that part of the floor close to the supports of the machine would have to vibrate in harmony with the latter, with the same amplitude, but if a rubber cushion is interposed the floor need not vibrate nearly as much as the machine itself. Moreover, owing to the internal friction of the rubber, a damping action is produced which tends to limit the vibration of the machine itself. It is true that as originally used for engine mounting the elastic deformation of the rubber blocks under the forces incident to engine operation was very slight, and only vibrations of very high frequency and small amplitude were absorbed. Moreover, with the conventional three and four-point supports, only vibrations in a straight line (as contrasted with oscillatory movements) were appreciably affected.

A number of other features besides rubber cushioning have been introduced in powerplant-mounting practice in recent years. One of the first of these was the use of a transverse, half-elliptic spring for supporting the forward end of the engine, on the Maxwell car in 1925. The engine was mounted on the frame by two supporting arms cast on the flywheel housing. Now, since the inertia force in a four-cylinder engine is effective in a vertical line through the middle of the central bearing, with the front end freely supported on the frame front crossmember through a comparatively light plate spring, it is obvious that under the effect of the secondary inertia force the engine could vibrate independently of the frame, and that the conditions of synchronous vibration of the frame under secondary inertia must have been greatly modified, even if such vibration was not completely prevented. Interleaf friction of the spring constitutes a damping force which tends to limit the motion of the forward end of the powerplant relative to the frame. It should be understood that this mounting takes care only of vibrations due to inertia forces and does not affect frame vibration due to variations in engine torque.

Center of Percussion

One idea that was put forward at the time was to swivel the powerplant on two supports at the rear end, locating these supports in such a way with relation to the distributed mass that the center of percussion coincides with the axis on which the secondary inertia forces act, that is, a vertical line through the center of the center bearing. What is meant by the center of percussion may be readily explained by reference to the door stops which take the shock when a door (in a building) is thrown open with force. The stop is located about two-thirds the width of the door from the hinged side, which is the center of percussion. If this arrangement is used the shock received by the door upon contact with the stop is balanced in such a way that there is no strain on the hinges. It is, of course, self-evident that if the stop were fairly close to the hinged side of the door there would be a tremendous strain on the hinges and their fastenings if the door were thrown violently against the stop.

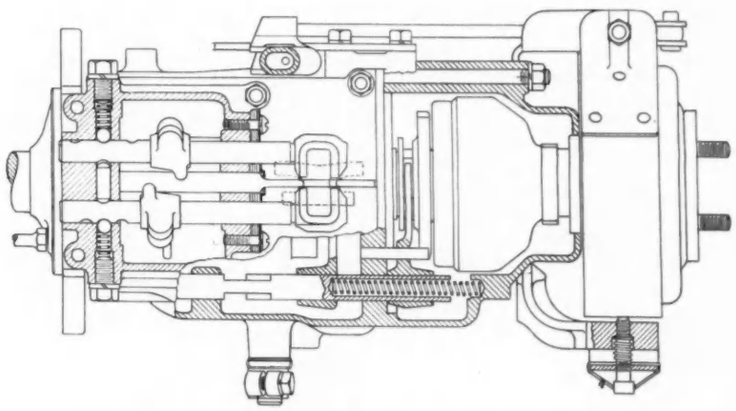
If the rear supports are so designed that they permit the powerplant to swivel around them, and are so located as to bring the center of percussion into the vertical line through the center of the center main bearing, then evidently the secondary inertia force, which acts along this line, will produce no force on the frame at the two rear points of support, and the whipping of the frame which ordinarily results from synchronism between the frame and the secondary inertia forces is eliminated. The sec-



Stabilizing spring of Plymouth powerplant

ondary inertia force then spends itself in setting the engine in vibration around the rear supports, and to minimize such vibration suitable damping means have to be provided. These damping means, of course, must have a support on the chassis, and they subject the frame to a periodic force, which, however, need be only a small fraction of the secondary inertia force itself.

A further step in advance in flexible engine mounting was represented by the Oakland eight, which made its appearance early in 1930. This is an eight-cylinder vee engine, with a single-plane crankshaft in which the unbalanced secondary forces of the reciprocating parts combine to produce a horizontal reciprocating force through the axis of the crankshaft. The engine is mounted at the forward end on the frame side rails through the intermediary of two multi-leaf flat springs arranged at an angle to the horizontal. This mounting on flexible members enables the engine to rock on the chassis, the more so as the supports at the rear end of the powerplant are rubber-insulated and comparatively close to the powerplant axis. To take care of the horizontal reciprocating force due to the secondary harmonic of the inertia forces, a single-armed lever is fulcrumed on the lower part of the crankcase, its upper free end resting against a four-lobed cam on the projecting part of the camshaft. Against a point on the lever not far from its fulcrum bears a spring-pressed plunger which extends all the way to the frame side member and ends in a sort of paddle located between two friction plates. The three plates are pressed together by a coiled spring surrounding a stud mounted in the frame side member. The motion imparted to the lever by the cam and the spring surrounding the plunger has the effect of imparting lateral impulses to the frame, and these impulses are so timed as to oppose the impulses imparted to the frame by the engine directly through its mountings. Of course, when the cam acts to move the lever away from the axis of the camshaft there is a reaction on the engine block. A rocking motion is imparted to the engine block in this way, and since the mounting of the block on the frame is such that the former can rock within limits independent of the latter, the chassis will not be set in vibration by the secondary forces, or at least such vibrations will be damped by the friction damper on the end of the spring plunger.



Plymouth transmission, top view, showing arrangement of shift rails and free-wheeling lock-out

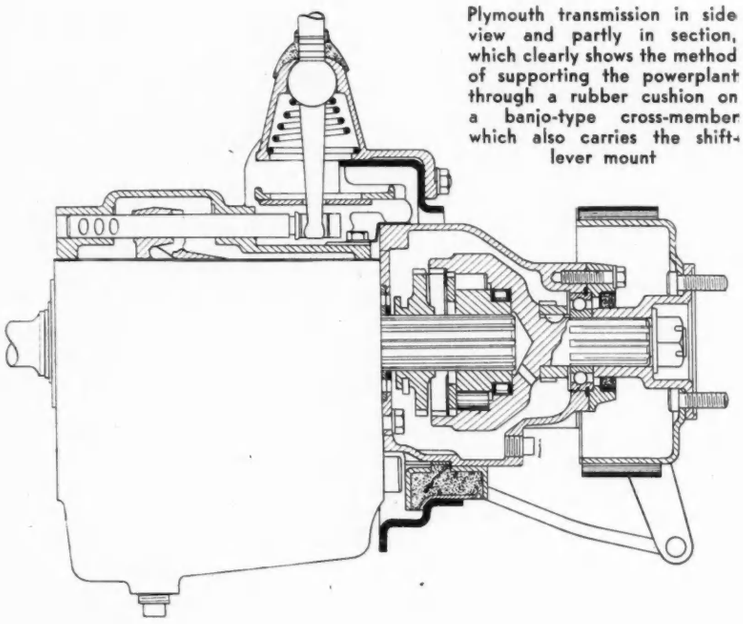
Plymouth Mounting

The latest development in the line of flexible mounting of powerplants is embodied in the new Plymouth, a four-cylinder car. In this the two principal causes of vibration to be provided against were variations in torque reaction, and the unbalanced secondary inertia forces. To prevent vibrations of the engine block, due to variations in torque, from being transmitted to the chassis and body, the powerplant is supported on the chassis virtually at two points, at the front and rear respectively, a line connecting these points of support passing through the center of gravity of the unit. It has been found experimentally that this line forms the axis around which the engine tends to rock as a result of torque variations. The impulse due to an increase in torque causes the powerplant to rock around its axis of support, and to limit this rocking motion and return the powerplant to its normal position, a leaf spring is secured to the bottom of the crankcase, the end of which has a support on one of the frame side rails. As the block starts to rock or move away from its normal angular position, energy is stored in the spring, due to the elastic deformation of same; presently a state of equilibrium is reached where the rocking force and the restoring force exactly balance, and as the rocking force decreases further the spring returns the block to its normal position and carries it even beyond that position, this latter result being contributed to by the angular momentum which the block has attained when it reaches the neutral position. If no damping means were provided there evidently would be a series of oscillations around the normal angular position, and to prevent this the end of the leaf spring is held between friction plates which exert a suitable damping action and decrease the oscillations due to a torque impulse at a rapid rate.

What Determines Axis of Oscillation

The question naturally arises why the powerplant should rock around an axis considerably inclined to the crankshaft axis when the torque producing the rocking motion is around the crankshaft axis. The explanation undoubtedly is that the motion to which the impulse gives rise depends not only upon the direction of the impulse, but also upon the resistances encountered. When a sudden torque impulse is applied to the powerplant, the chief resistance encountered is undoubtedly due to the angular inertia of the block. If the block is mounted comparatively flexibly and not restrained to rock around any particular axis, it will rock around that axis around which its polar moment of inertia is a minimum. This axis passes through the center of gravity of the block. Moreover, it will not be parallel with the crankshaft, for the reason that at the forward end most of the weight is above the crankshaft axis, while at the rear end (in the transmission) most of the weight is below the axis.

The principle involved can be readily understood



Plymouth transmission in side view and partly in section, which clearly shows the method of supporting the powerplant through a rubber cushion on a banjo-type cross-member which also carries the shift-lever mount

by referring to a simple experiment. Consider a circular disk of metal to be suspended by a long string from a fixed point. If we apply a lateral force to the disk slowly it will swing around the fixed point of suspension. But if we give a sudden blow to the lowest point of the disk, for instance, it will swing around a horizontal axis passing through its center —its axis of gyration. In the first case the principal resistance to be overcome is that of gravity, while in the latter case it is inertia.

The axis around which the powerplant naturally tends to rock under torque impulses is evidently the best axis on which to support it, for if the pivotal support were on any other axis, a certain component of the torque impulse would be transmitted directly to the frame.

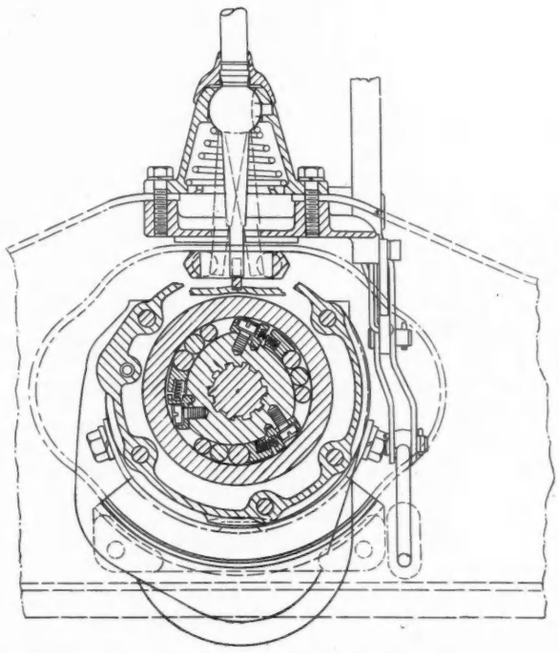
It will be obvious that if the powerplant is supported in such a way as to be capable of a rocking motion around the axis around which it tends to turn naturally, and its rocking motion is limited by a spring with suitable damping action, the transmission of torsional vibration from the powerplant to the frame can be almost completely prevented. Owing to the fact that the spring must have its support on the frame and that the pressure of the spring varies throughout the cycle of rocking motion of the powerplant it would seem that vibration cannot be entirely eliminated, but experience shows that it can be reduced to a negligible minimum.

The effect of the cushioned pivotal mounting is particularly notable when the engine is idling while comparatively cold. Under these conditions the succeeding explosions vary greatly in intensity, as indicated by the varying loudness of the exhaust reports. This is undoubtedly due to imperfect charge distribution in a cold engine. Occasionally a cylinder will get a charge of such composition that the explosion is quite powerful, considering the low compression, while the cylinders preceding and following it in the firing order seem to get a charge which is so proportioned that combustion is either exceedingly slow or no combustion takes place at all. Under these conditions the powerplant will rock freely on its pivotal mounting, while the chassis is so little affected that a lead pencil can be stood on end on one of the front fenders without toppling over.

The chief cause of vibration in four-cylinder cars always has been considered to be the secondary harmonic of the inertia forces, and this does not seem so specifically provided for in the powerplant mounting under discussion. Nevertheless the usual effect of this unbalanced force seems to be absent, or at least hardly noticeable in the Plymouth. In four-cylinder cars as built in the past the second harmonic reveals itself by a pronounced whipping of the frame at a certain engine speed, usually corresponding to about 30 m.p.h. in high gear. This whipping of the frame, of course, is communicated to the body, which is bolted to it. There is a similar but considerably less pronounced effect at two-thirds of this speed, which is due to the third harmonic, also unbalanced or uncompensated in a four-cylinder engine.

Naturally, when the engine is bolted rigidly to the frame the alternating vertical impulses are impressed upon the frame directly. In fact, the engine structure, with its supporting arms, forms part of the system that is set in vibration by these impulses. In the present case the engine is supported upon the frame through the intermediary of elastically deformable rubber cushions, which also, by reason of the so-called elastic hysteresis of the rubber, exert a certain damping action. Evidently, owing to their separation by a medium of comparatively high elasticity, the engine structure and chassis frame cannot vibrate as a unit the same as in a car

(Turn to page 193, please)



Transverse section through Plymouth free-wheeling unit and shift-lever mount

JUST AMONG OURSELVES

Thrills in Memories

WISH we could have had a concealed dictaphone to record for all our readers a transscription of the conversation—full of human interest, romance and sentiment—which took place over the luncheon table recently when the first meeting of the 1932 Contest Board of the AAA adjourned for luncheon in the middle of an all-day session. Seated at the head of the table was Capt. Eddie Rickenbacker, known to the world as an aviation ace during the war, but more intimately to the followers of automobile racing as a leading star to the roaring road long before he gained international fame.

A new member of the Contest Board is none other than Barney Oldfield, probably the most famous of the speed demons who made racing history in the early days. And next to him was another new member of the Contest Board, Joe Dawson, winner of the Indianapolis race in 1912. Nearly every other man at the table—Pop Myers, "Eddie" Edenburn, Ralph Pillsbury, Bill Sturm, Ray Sherman and others —through long and intimate association with automobile racing, either as drivers or officials, had mind and memory chock-full of thrilling incidents and glorious recollections associated with people and events in this most sensational of all sports.

Naturally the talk turned to racing, and just as naturally it turned to the early days. The writer got a real thrill as he listened.

"Was there any difficulty in keeping people from cutting corners in the old road races?" somebody asked of Barney Oldfield. A glorious chuckle came from the veteran speed king; then he replied:

"Well, I don't know very much about that. I do remember one road race in the old days, however, when I had been driving along for about five miles trying hard to keep ahead of a chap who was right on my tail. I had been watching him out of the corner of my eye for a long while, in order to be sure that he didn't pass me. Suddenly, I didn't see him any more, and I remarked to my mechanic, 'I guess we shook that lad after all.' I kept on going full tilt for about ten miles further when suddenly I came on this same man. He was working in the road ahead of me changing a tire!"

Lubricated Tires Once a Moot Point

THEN Eddie Rickenbacker harked back to some races in Venice, Calif., in the days when he was driving a racing Maxwell. Somebody recalled the contraption which Rickenbacker had designed into his car for one race for the purpose of shooting oil over his tires periodically and thus saving them from overheating and wearing too rapidly while making turns at high speed. The device with the car on which it was installed was held in great secrecy until the day of the race and finally was brought on the track just before starting. Eddie told with delight of the curiosity about the car which every one had exhibited before the race and of the difficulties he had had in keeping this feature a secret; while "Eddie" Edenburn remarked that he and the other officials in charge of the race had been saved a very difficult problem in interpretation of the rules by the fact that Rickenbacker burned out a bearing or had some other serious mechanical trouble which threw him out of the race long before the finish. Consequently, no official ruling was ever made as regards the legality of the device.

But Rickenbacker and Oldfield both agreed that the worst place to race in the old days was out in Tucson, Ariz. Asked about the nature of the track, Oldfield said: "There wasn't any track. They just spaced off a few lines out on the prairie and then said 'Go to it'."

At the end of the race, such cars as finished were hanging together only by a miracle, Eddie Rickenbacker's engine being held to the chassis precariously by only one of four original bolts. And so it went.

DeSoto Dealers Sell Plymouths

THE possibilities which lie in merchandising Plymouth cars were emphasized to practically every meeting of dealers held by Chrysler units during the recent show weeks. Walter Chrysler himself spoke emphatically about Plymouth in talking to the Chrysler dealers in New York.

The relative importance of the low-priced line was shown very definitely at the DeSoto dealer luncheon where it was said that 53 per cent of the dollar volume of business done by DeSoto dealers has consisted of Plymouth sales since the Plymouth was made available to DeSoto dealers in March, 1930.

Merchandising Plan for Replacement Parts

EFFORTS of individual car factories to get back a greater share of replacement parts business have brought together service and parts men from the various car manufacturing organizations for the exchange of ideas and discussion of mutual problems.

Factory service managers, it is understood, are planning to meet with some regularity under N.A.C.C. auspices with the objective of coordinating and developing factory merchandising efforts in the replacement parts field. Vast, though very gradual, possibilities for radical changes in present factory parts distribution methods seem to us to be inherent in the eventual results of such association.—N.G.S.

Non-Productive Workers Share in

by Joseph Geschelin

EARNINGS represent the most vital point of contact between management and workers. Methods of wage payment, therefore, particularly incentive plans, assume an important place as a tool of management. Industry affords many examples of carefully designed incentive plans producing better earnings for the workers and correspondingly lower product costs.

Where a straight day wage has been previously paid, any wage incentive will produce better earnings for the operator, but in other cases, earnings depend entirely upon the nature of the plan. However, apart from its effect on wages the right kind of wage plan always promotes better relations between management and workers, and results in lower product costs. Obviously the success of the management program depends entirely upon the selection of a wage plan suited to the particular line of business in question.

But this is no simple task, however. There are about twenty-five basic plans and many variations of these.* Among other things the design of the wage plan depends upon operating

* For a comparative analysis of these see "Wage Incentive Methods" by C. W. Lytle.

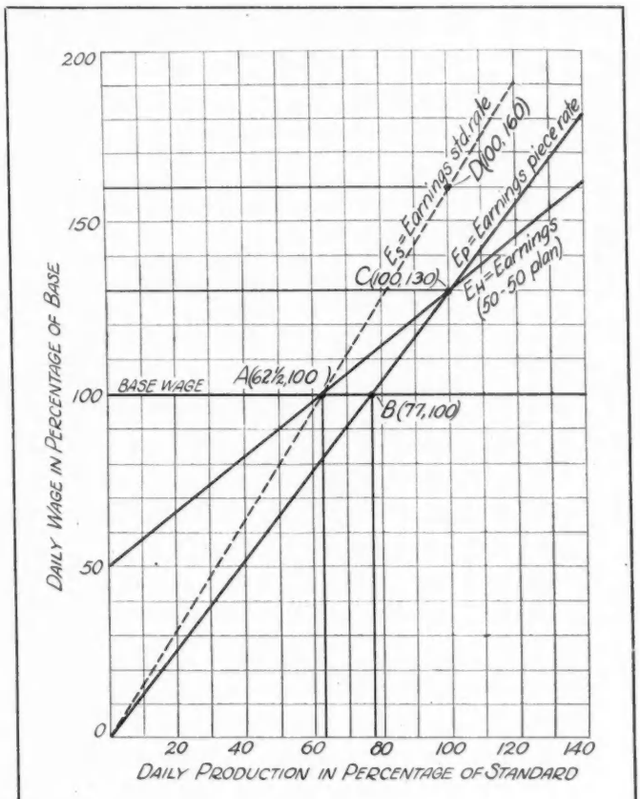


Fig. 1

Elements of Norton wage plan. The new 50-50 earning curve is represented by E_b.

Fig. 2

How to Figure a Single Job

5 pieces (time each .42) (Set-up .40)
Allowed time is 5 times .42 —
210 plus .40 = 2.50 Hr.
Suppose actual time spent is 1.50 Hr.

Then time saved is 1.00 Hr.

You will be paid for the actual time spent (1.50 hr.) plus one-half of the time saved (.50 hr.) or a total of 2.00 hr. at your regular hourly rate.

You get one-half of the time saved. The other half is used by the company to furnish utility men, continuous improvements in methods, tools and instructions, all of which give assistance to you and the Norton Co.

If you perform every job in about two-thirds of the allowed time, you will earn about 30 per cent over your hourly rate.

Keep a Record of Your Earnings

How to Figure a Day's Work

Date	No. Pieces	Time Each	Set-up	Total Time
9–20	5	.42	.40	2.50
	5	.70	.21	3.71
	2	.15	.35	.65
	15	.26	.21	4.11
	4	.72	.35	3.23
	12	.12	.21	1.65
			TOTAL HR...	15.85

From tables in center of book, if you have worked 10 hours, your earnings would be:

84c per hour if you are a 65c man
77½c per hour if you are a 60c man
71c per hour if you are a 55c man

Under this system, your hourly rate for the week's work is guaranteed, while on incentive rates.

Fig. 2 (at left)—Details of plan explained to the workman

Norton Wage Plan

Plant layout re-arranged and new equipment added to make incentives effective in Worcester (Mass.) factory

conditions, the nature of the product, variations in demand, etc.

A wage plan recently put into operation by the machine division of the Norton Company of Worcester, Mass., was preceded by a complete change in planning and plant layout and the installation of new manufacturing equipment, thus providing an ideal setting for the experiment. The plan is generally known as the 50-50 plan and fits nicely into a set-up of moderate production, fluctuations in production rate, and a variety of small lots. The important elements of the plan are given in Fig. 1.

Point A (62½,100) is the low task, base wage point under the new plan; incentive being earned along the line E. Prior to the installation of the 50-50 plan, this company used a straight piece rate shown as E_p. The low task, base wage point for this plan is B (77,100). Note particularly that both earning curves intersect at point C (130,100) which is 100 per cent efficiency.

How does this work out in practice? A brief analysis of the relations in Fig. 1 will make this clear. Let us first assume the nomenclature given in Table 1. Then referring to Table 2, equation 2, for earning curve E_p follows from analytic geometry—its slope being 1.3. The general form of the earning curve E_h in the 50-50 plan is shown in equation 4. Its slope is one-half of standard time and intercept or intersection with the base wage scale one-half of the base wage or at the 50 per cent point.

It is evident that the slope of the earning curve is still variable and requires further definition. By making the curve pass through point C, the slope is exactly specified because the line now contains two specific points—the vertical intercept and point C. The

Table 1
Standardized nomenclature

H_s = hours standard

H_a = hours actual

R_h = rate per hour

E_p = earnings in dollars — old piece work plan

E_H = earnings in dollars — new plan

E_s = earnings in dollars—standard rate

$\frac{H_s}{H_a}$ = percentage efficiency

Table 2
Formulas for earnings curves

$H_a R_h$ = base rate 1

$$E_p = \frac{130}{100} \times \frac{H_s}{H_a} (H_a R_h)$$

$$= \underset{\text{slope}}{1.3} H_s R_h \quad \text{..... 2}$$

$$E_s = \underset{\text{slope}}{1.6} H_s R_h \quad \text{..... 3}$$

$$E^H = H_a R_h + \underset{\text{savings}}{(H_s - H_a) \frac{R_h}{2}}$$

$$= \underset{\text{slope}}{\frac{R_h}{2} H_s} + \underset{\text{intercept}}{\frac{H_a R_h}{2}} = \text{general equation} \quad \text{..... 4}$$

$$E_H = H_a R_h + 0.8 \left[\frac{H_s}{H_a} - 62.5 \right] H_a R_h$$

$$- \% \text{ above point } A$$

$$= \underset{\text{slope}}{0.8 H_s R_h} + \underset{\text{intercept}}{\tfrac{1}{2} H_a R_h} \quad \text{..... 5}$$

where 0.8 = ½ of slope for E_s

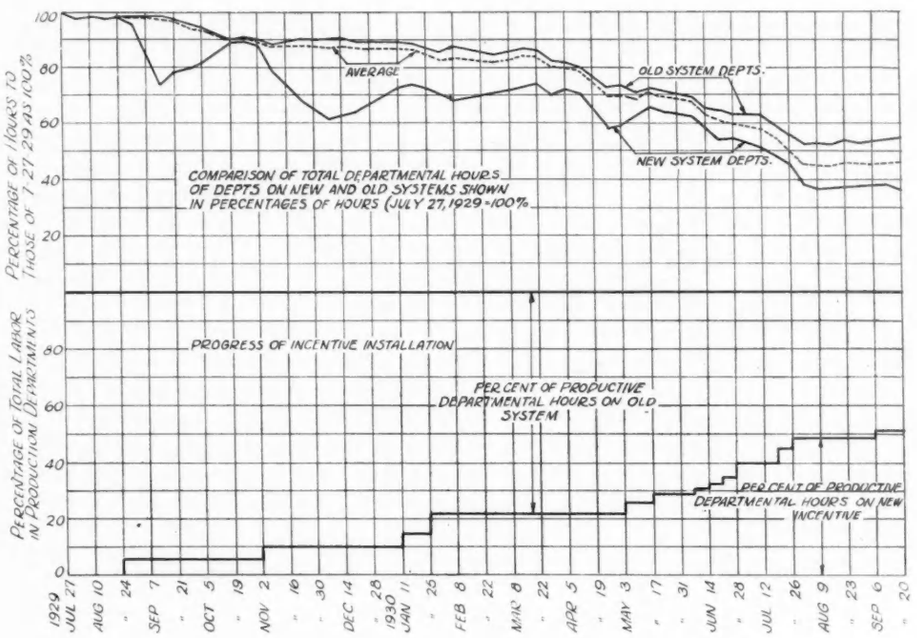


Fig. 3

Results of new wage plan compared on basis of productive hours. Upper curves show that new system departments operate on smaller productive hour charge for the same output

equation for this earning curve E_h may now be written as in formula 5, the slope being 0.8. To complete the analysis, let us introduce E_s, passing through point A and intersecting the 100 per cent efficiency line at point D (160,100). As shown in equation 3, the slope of this line is 1.6, or twice that of E_h. We may now define E_s as being the standard earning curve for the new plan. The amount of incentive is a measure of the ordinate from the base wage to E_s; the worker's share is one-half of this and will lie along E_h.

Now we can see more clearly the relation between the new plan and the old one. Point C (130,100) or 100 per cent efficiency is the break-even point at which the operator will earn as much under the new plan as he did before. Above this point the operator will earn less under the new plan, the difference being a measure of the shaded area. Below this point, the operator has decided advantage since the limit of the base wage is at 62½ instead of 77 per cent efficiency.

To take a numerical example, let us say the job is completed in 10 hours, standard time. On the straight piece-work plan, if the operator did this job in 10 hours, he would be paid for 13 hours. In the 50-50 plan he saves 6 hours from the allowed time of 16 hours (160 per cent of 10 hours) and is paid for half the time saved or one-half of 6 hours, plus 10 hours, which is a total of 13 hours.

This is exactly the same as the straight piece-work plan for standard performance. For substandard or above standard performance, however, the two plans differ materially. This difference is what makes the 50-50 plan superior to the straight piece-work plan in the opinion of the management. There are three points of superiority:

1. It practically eliminates the necessity of day-rating jobs, a practice that is found necessary many times in a straight piece-work plan. The reason for this is that for performance below standard the operator is penalized to a lesser degree.

2. It eliminates the desire for rate-cutting—a practice common in nearly every straight piece-work installation, whether it is admitted or not. Rate-cutting has caused considerable trouble in many piece-rate installations, and has had the effect of curtailing production. In the 50-50 plan the increase in earnings is not as pronounced above 100 per cent efficiency; besides, for every hour saved by the operator, an equal amount is saved for the company.

3. Another advantage is that even the slightest improvements, due to new methods and equipment, automatically bring returns to the company as well as the operator. In the straight piece-work system, these small improvements, in the course of several years, amount to a considerable increase in earning power without entailing increased effort on the part of the operator. Yet although the operator realizes this, he objects strenuously to rate-cutting. The net result is that the operator holds down production and the company is unable to realize much from the improvements it has made.

This plan, then, has decided advantages for the employer because he participates in the improvement of efficiency of the operator. In return, the operator, although getting only half the savings above 100 per cent efficiency, is not constrained to hold back on his production for fear of rate-cutting, and can thus increase his earnings appreciably. Naturally, the acceptance of this plan by the workman depends entirely upon the slope of the earning curve and its relation to the original plan.

But the real strength of the plan and its effect upon the morale of the employee is the fact that the company's share of earnings is not credited 100 per cent to the company. On the contrary, it is a basic part of the plan that a part of the company's share goes to the payment of a bonus to certain non-productive workers. Thus in each department there is an incentive plan for the foreman, truckers, tool-crib attendants, etc., which

has a marked effect on the operator's earnings because the non-productive workers help him convert all his time into actual productive effort.

Now it is well known to men who have worked with incentive systems that the success of a new installation depends largely upon the completeness of the information given the operators. Norton management has taken care of this by giving the men complete details of the plan and supplying them with work sheets, one of which is shown in Fig. 2, from which the individual can figure his returns from a single job or a day's work.

Needless to say a wage incentive plan is only one tool —stabilized earnings—in a program of cost reduction. Many other important considerations enter in. At Norton, for example, the net result has been achieved in a variety of ways, as for example:

1. Rearrangement of departments—so as to provide a more logical flow of material from the raw to the finished state.

2. The use of new manufacturing equipment. This is a fundamental matter as costs cannot be improved with the use of obsolete and out-moded machinery.

3. Use of maximum feeds and speeds. This results from the installation of modern equipment capable of higher speeds and the utilization of new tooling whereever desirable.

4. Elimination of lost time through the use of better materials handling methods—tool crib control, etc.

5. Better blue prints with more complete details.

6. Standardization of finish, heat treatment, etc.

7. Indirect labor bonus—already discussed above.

Under the new plan, the workman no longer worries about such details as sharpening tools and trips to and from the tool crib. This work, with many other minor details, is taken care of by a non-productive worker, whose function is to do these odd jobs for all the men in his department. The general utility and cooperation of this individual are greatly stimulated by the bonus, which is paid out of the company's share of the operator's savings.

The whole thing has the elements of a fine partnership between the management and the individuals within the department. The combination of these elements has made it possible to reduce manufacturing costs and at the same time pay the operator higher wages. This, despite the fact that piece-rate theoretically should give better returns to the workman.

In management, as in other fields of endeavor, the proof of the pudding is in the eating. The best measure of the success of the new wage plan, as well as the other improvements which have been introduced, lies in a critical analysis of the results achieved since the change was put through about two years ago. A clear picture of these results, as well as some idea of future development, may be gained from the graphs, shown in Fig. 3.

According to the factory management, it was noticeable that, as a department was started on the new incentive, a marked decrease occurred in the number of men and the number of machines needed to carry on the work. This was probably more noticeable in the earlier departments than those which went in at a later date, because the volume of business was steadily dropping off. The decrease in the number of machines required proved to be very opportune, as it came at a time when various departments were being rearranged.

Since it is difficult to show numerically the savings in labor and equipment in all cases, the number of actual hours worked was taken as a criterion. Such comparison of total departmental hours on the old and new systems is shown in the upper portion of Fig. 4. This is given in terms of the percentage of hours from week to week with respect to the hours consumed heretofore where the time consumed on July 27, 1929, is taken as 100 per cent. Over the 14 months covered by the chart, the reduction in hours reflects the decrease due to the slackening of business. An interesting feature of the upper curves is that the departments on the new incentive show to better advantage with respect to the average.

For example, on September 20, 1930, there were about 52 per cent of total productive hours on the new incentive, so that a comparison of the two systems might well be made at that time. It is noticeable that where the old system departments required nearly 55 per cent of normal hours to perform their share of production then available, it took the new incentive departments a little over 35 per cent of their normal hours for their share of the same available production. The management feels that it is fair to assume that the saving of about 20 per cent was due entirely to the new incentive.

It seems fair to assume further that when remaining departments swing in, they will also show a saving of about 20 per cent. Moreover since this saving was made during a period of depression, when the average departmental efficiency was only about 85 per cent, in more normal times the savings might easily be 25 per cent, instead of 20 per cent.

The lower portion of Fig. 3, which is used in conjunction with the upper curves, shows chronologically the progress of incentive installation by departments.

Nor have these departmental savings been the only gains recorded. Consider the improved efficiency of indirect labor departments such as tool cribs, tool making, trucking, etc. These have responded remarkably to the combined effects of the reorganization and added compensation due to the new incentive system.

Flexible Engine Mountings Progress

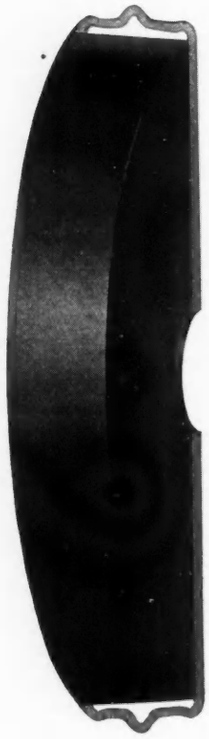
(Continued from page 188)

in which the engine is rigidly mounted on the frame. Vibratory forces are still being impressed upon the frame through the rubber cushions, but the frame by itself, owing to its comparatively small mass, probably has such a high rate of natural vibration that engine speed corresponding to synchronism with the second harmonic is outside operating range.

Flexible mounting of the engine on the chassis does not suppress vibration of the engine. On the contrary, it allows the engine to vibrate rather more freely than if it were bolted down to the frame rigidly. Therefore, to prevent annoyance to the driver by engine vibration it is necessary to so arrange the controls that engine vibrations cannot be transmitted to them and through them to the hands and feet of the operator. In the Plymouth this is accomplished as follows:

The clutch and brake pedals, which in many cars are mounted on the powerplant, in this car are carried on brackets mounted on the frame. The brake master cylinder (hydraulic brakes) also is mounted on the frame, hence the braking system is entirely independent of the powerplant. The clutch pedal is so arranged that it is not in direct contact with any part of the powerplant except when the clutch is disengaged.

Kelsey Achieves Fused, Weldless Brake Drum



More rapid heat-diffusion from the braking surface claimed for new centrifugally cast rings, which are said to be as light as pressed steel

Above—Photograph of a completed drum showing the strengthening and cooling ribs made possible by the composite structure. Location of these drum ribs of course varies with different brake and car designs

Right—Section through a Kel-se-fuse drum showing the method of stamping and the location of the cast iron

A NEW one-piece brake drum, with a cast-iron liner centrifugally cast into a pressed-steel drum, and known as the Kel-se-fuse, has been announced by the Kelsey Hayes Wheel Co., Detroit. There are no welds or rivets in this drum, the backing plate and ring, with its reinforcing ribs, being stamped out in one piece. Company officials claim that this not only affords protection against loosening of the various parts, but also enables more rapid heat dissipation from the braking surface by conduction into the backing plate and radiation from there.

The drum has been designed to provide the maximum of strength with the minimum of weight. It is pointed out, for instance, that the centrifugal casting of an iron liner into the drum makes possible a reduction in the stock thickness of the sheet metal from which the drum proper is stamped to the point required from considerations of strength of the backing plate. In pressed-steel drums without such liners, it is claimed, the backing plate has to be made heavier than necessary as the stock thickness is determined by the amount of material required in the ring for adequate strength and heat capacity (distortion).

In fact it is stated by company engineers that the Kel-se-fuse drum is no heavier than the conventional comparable pressed-steel drum, in spite of the addition of the cast-iron liner, with its highly desirable characteristics of reduced drum scoring, increased lining life, and the high rate of heat dissipation obtained with the excellent bond resulting from the centrifugal casting method.

In the manufacturing process a brake drum with a ribbed section to protect against distortion, and increase its strength, is first stamped out of steel. This is then heated to red heat and rotated at high speed, while maintaining the temperature of the drum, while molten "Kelsite" iron, to form the braking surface, is spun into the drum, fusing with the drum in the same manner as babbitt is spun into connecting rods to form the lower end bearing.

The equipment is designed of course to insure the coincident cooling of the hot drum and its liner, to remove the possibility of the brake drum becoming distorted when reheated as the result of service brake application. Electric furnaces are used for the melting and conditioning of the iron, with very close temperature control in order to secure the closest grain structure possible. Accuracy of control while casting is also required in order to obtain uniformity of grain structure throughout the circumference.

Deep Conflicts Stir Engineers at Detroit

(Continued from page 183)

Repair Standards Arouse Interest of Engineers

THE paper on repair and junking standards by Joseph Geschelin, which was published in *Automotive Industries* last week, drew some of the most prominent figures in the truck industry. Evidently this matter of closer cooperation with the service field and the preparation of more comprehensible service information was taken very seriously by engineers and operating men.

M. D. Munn, White Motor Co., turned in an interesting discussion in which he concurred that the service man should be provided an accessible table of clearances to guide him in the refitting and adjusting of parts. He cautioned about the necessity of judgment in the application of these clearances due to wide variation in operating conditions.

The factory side of the picture was covered by W. L. Hindman who stressed the need for a standardized system of tolerances which would permit better interchangeability at less cost.

B. B. Bachman, vice-president of Autocar Co., brought out the important point that quality and wear life go hand in hand. It is well known, for instance, that surface finish has an important bearing on the life of a part—the better finish giving longer life. Accordingly, wear life may not be judged purely on the basis of dimensions except where all conditions are about equal.

J. F. Winchester, Standard Oil of New Jersey, suggested that service stations already have tools many of which are just about useless because of imperfections and inaccuracy. He also said that various makers have employed traveling service men for years. While this is true, the paper proposes an entirely different set-up. What is needed is an organization of engineers (and not purely service department men) working from the engineering department and contacting the service station.

A. W. Scarratt, International Harvester Co., said that tolerances are already available to factory branches and probably could be made available to certain fleet operators who do their own work.

M. C. Horine, International Motors Co., advised that the information needed is that pertaining to clearances rather than actual dimensions and tolerances. This is on the assumption that parts will be selectively fitted at the service station.

Dr. H.C. Dickinson
Bureau of Standards

Dr. Dickinson and O. C. Bridgeman went into the "Fundamentals of Automotive Lubrication" at the Research Session, Friday, Jan. 29, which was presided over by Dr. J. B. Hill

J. C. Moxie, Atlantic Refining, pointed out the complications involved in an operation containing varied makes of vehicles in order to show the difficulty of applying specific standards. Mr. Geschelin pointed out that if specific standards are the answer then the complication of many makes certainly does not justify the continuance of an inadequate method.

Two Points of View Given at Excellent Diesel Session

ONE of the finest research contributions in connection with Diesel work that has been placed before the society for some time was incorporated in a paper by A. W. Pope, Jr., and J. A. Murdock of Mr. Horning's own company. While a summary of this paper in the limited space available here is out of question, it is highly recommended to anyone interested in the subject of the development of Diesel engine fuels. This paper is based on work done as a result of the design and construction of a Diesel type C F R engine by Wau-

kesha, an engine that, as one gentleman expressed it, almost thinks for you.

This development was particularly interesting in view of its contrast with the method of attack used by Julius Kuttner of Oberhaensli et Cie. As D. P. Barnard of the Standard Oil Co. of Indiana put it, Mr. Kuttner's method of attack was, first, to build up a fairly complicated structure and then to study this in order to find an answer to the question of "where do we go from here?"

Both methods of attack received support from those participating in the discussion, with the odds slightly in favor of the Waukesha method, due to its somewhat more fundamental character. For instance, E. T. Vincent of Continental Motors Corp. objected to Mr. Kuttner's analysis, due to the fact that it was based on an ante-chamber design of Diesel. Mr. Vincent furthermore, provided considerable proof that in the larger Diesel engines open chambers could be made to give highly satisfactory and consistent performance at low speeds. Probably there was no argument between Mr. Vincent and Mr. Kuttner, as the latter was referring mainly to an automotive size of Diesel engine.

Inevitably a discussion also arose during the session as to the cost of Diesel fuels.

A curious phase of the Diesel session is that much of it dealt with cycles not of the strictly Diesel type, and O. D. Treiber of the Hercules Motors Corp., chairman, voiced the question of a number of those present, when he said that it seemed that the more we got into Diesel engines the farther away from the Diesel cycle we seem to get.

Sub-Executives in Management Praised at Production Session

GORDON LEFEBVRE, at the Production Session, emphasized the importance of sub-executives in the modern management field. In his opinion, the personnel problem may be defined in the following manner:

1. Selection by some reliable rating system.
2. Proper training.
3. Fair compensation.

To establish the proper contact between these men and the management, it is suggested that at appointment of a new man an introduction should be made by an officer of the company who will give the applicant a little insight into the business and its objectives.

Perhaps the most important point was the statement that one of the minor executives represents an investment of at least $5,000 to his employer. Unquestionably this is the most powerful argument against unhealthy turnover in this group. Estimates recently made by other speakers place the cost at between $10,000 and $15,000.

He concluded with an emphasis on the need for a real application to this problem. The foreman and similar line executives are the backbone of industry and much can be lost if their morale drops in any way.

One of the features of the session was a short movie reel showing some striking automatic loading devices recently developed by the Seneca Falls Machine Co. E. R. Smith presented this film at the request of the production group, this being the first public showing of an outstanding development in machine shop practice.

One loading device for automatic lathes is an electrically-operated attachment connecting three machines. In this set-up, a shaft is centered in the first machine; rough turned in the second, and finish turned in the third. Transfer machine to machine is fully automatic by means of the overhead, mechanical hands. Interlocking switches are used to control machine cycles and shut down the battery in the event of trouble.

Another machine demonstrated uncanny speed in turning bearing races, three being completely finished in one setting, from one forging. Another high-speed job was the turning of bushings with automatic loading and ejecting. The operation of the machine is so fast that the eye could hardly follow the motions from ejection of a finished piece to the loading of a rough piece.

Body Vibration Should Be Stopped at Source, Paper and Discussion Show

THERE seems to be some difference of opinion as to whether low or high frequencies in body vibration are more annoying as evidenced by the discussion at the body session. It is evident that the higher frequency vibrations are much more difficult to control or absorb than those in the lower ranges, however.

C. L. Humphrey of the Chrysler Corp. was of the opinion that sound-deadening material is not sufficient to take care of high frequency panel vibrations, differing in this respect with W. A. Jack in the discussion of Mr. Humphrey's paper, "Noise and Heat Control in the Automobile Body." Everybody seemed agreed, however, that one of the best places to start in silencing a body is to eliminate the sources of vibration or isolate these vibrations so that they cannot be amplified after being picked up by body panels.

"Safety Factors in Automobile Body Design" was the topic of a paper by Maxwell Halsey of the National Bureau of Casualty and Surety Underwriters. Curiously enough, a good proportion of the discussion which followed centered about a device which has been suggested time and again and which various manufacturers have attempted to market through the replacement trade with but slight success, this being a direction indicating signal. It seemed to be the consensus that such directional signals would eventually become

C. L. Humphrey
Chrysler

Mr. Humphrey led off with a paper on "Noise and Heat Control in the Automobile Body" at the Body Session on Tuesday, Jan. 26. A. J. Neerken was chairman of the Session

standard equipment on automobiles, either by action of the manufacturers themselves, or through legislation. Just what form they would take, however, seemed to be open to considerable question. Mr. Halsey suggested electrically illuminated signals at the rear, similar to a stoplight.

P. J. Kent of the Chrysler Corp. objected to this on the basis that the driver won't use anything he doesn't see, and thought that signals mounted on the front pillar post would be of greater value.

Mr. Halsey also seemed considerably concerned with the question of headlights. He would like to see headlights made in such a manner that they are not adjustable to a position bringing the cut-off above the horizontal. To this Mr. Kent also objected on the basis that production variations in fenders, headlamp brackets, etc., would make it impossible to adopt such an idea. Furthermore, Mr. Kent pointed out, that any injury to a fender would tend to deflect the headlight downward and decrease the safety to the driver, due to insufficient road illumination.

Bendix Flexible Metal Tubing

Bendix metallic tubing, showing construction and flexibility

A SEAMLESS, flexible metallic tubing, which is expected to find an important place in practically every industry, has just been placed on the market by the Bendix Aviation Corporation.

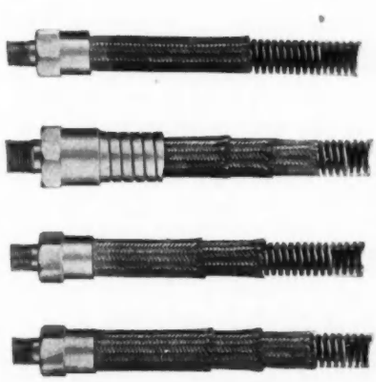
The new product can be used for fluid connections between moving parts, absorption of vibration, and conveyance of liquids, semi-liquids, steam or gas. Machinery installations can be simplified by eliminating L-fittings in pipe connections, and it is claimed that maintenance is reduced materially because the tubing eliminates slip and ball joints, and that replacement due to wear or deterioration is reduced to the minimum.

The Bendix hose has been applied to such widely varied uses as lubrication, gum manufacture, electric wiring conduits, automobile exhaust pipes, radiator hose, shielding airplane radio, hydraulic and airbrake systems, and oil burners. We are informed that it has withstood pressures of 10,000 lb. p. sq. in and temperatures of over 500 deg. F.

The hose is seamless from the tip of one fitting to the tip of the fitting at the opposite end, because the fittings are brazed or welded, forming an integral part of the hose. This construction tends to prevent leaks developing in the hose and breaks occurring between the hose and its fittings.

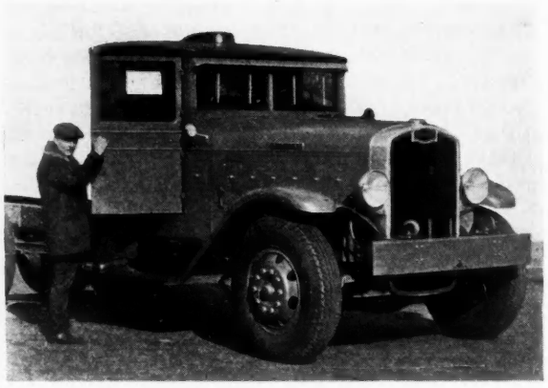
The hose is made of bronze-alloy seamless pipe, and is corrugated in round-thread, single-lead, deep-wall form. Because of its deep-wall construction (Fig. 1), the hose is said to be unusually flexible. A braided copper protective casing is designed to cover the hose with either one, two or three layers, depending on the pressure to be withstood. As a protection against mechanical damage to the braid covering and to distribute the flexing action, the manufacturer recommends use of an interlocked, unpacked galvanized steel casing over all (Fig. 2).

The new product is being made by the Bendix Stromberg Carburetor Company, a subsidiary of Bendix Aviation Corporation, South Bend, Ind., and we are informed that orders for 3,000,000 ft. for 1932 delivery were received before the formal announcement was made. The hose is at present being made with internal diameters of 3/16, ¼, ⅜, ½, ¾ and 1 in.



Bendix flexible metallic tubing with one, two and three copper braids and with a galvanized-steel casing

Big Gross Rating on Autocar Lorries



The streamlined protuberance on top of this Autocar cab incloses a ventilating fan

Both have:

Six-cyl. Sterling Petrel engine, reinforced frame, 3 wheel bases, four-speed transmission, and forced ventilation in cab

THE Autocar Co., Ardmore, Pa., has added two heavy-duty lorries to its lines, one a four-wheeler, the other a six-wheel unit. The four-wheeler, Model FE, has a gross-weight rating of 30,000 lb., and the six-wheeler, Model GE, of 45,000 lb. Model FE has a body-and-pay-load capacity of 8½ tons—Model GE, of 14½ tons.

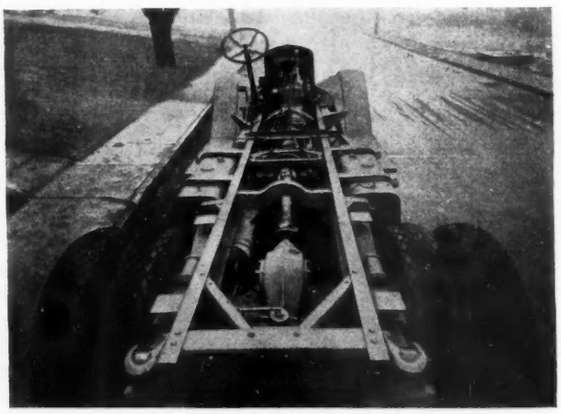
In general design the new models closely resemble each other, carrying the same engine, clutch, main and auxiliary transmissions, front axles, front springs, steering gears and air brakes on all wheels. The engine is the Sterling Petrel, a six-cylinder design of 5¼-in. bore and 6-in. stroke, which has a piston displacement of 780 cu. in. and develops 156 hp. at 1800 r.p.m. A starter and a generator (12-volt) are included in the equipment.

The rear axle of the four-wheel truck is a Timken-Wisconsin double-reduction, full-floating unit, its wheels being equipped with 10.50/24 balloon tires. The six-wheeler has a Timken tandem axle unit of the worm-driven, full-floating type, carrying dual 9.75/20 tires on each wheel. On Model FE the standard rear-axle ratio is 8.9, but options are given on ratios of 9.9 and 11.14, while the Model GE is furnished with any one of three different ratios, viz., 8.2, 7.6 and 9.0.

The frame side rails of both models have a maximum cross section of 10½ by 3 by 5/16 in., and the frame width is 34½ in. Frames are reinforced by an outside plate extending back as far as the rear-axle radius-rod bracket, and by liners from that point to the rear end. Each model is offered in three lengths of wheelbases, which for the four-wheeler are 180, 216 and 234 in., and for the six-wheeler, 198, 216 and 234 in.

Both a unit-mounted, four-speed main transmission and an amidships-mounted, three-speed, auxiliary transmission are fitted to each model. Speed ratios in the main transmission are 5.18, 2.86, 1.70 and 1, while those of the auxiliary transmission are 1.935, 1 and 0.71, the latter being an overdrive. Westinghouse air brakes act on all wheels, front and rear. Model FE has front brakes 17¼ in. in diameter by 3 in. in width, and rear brakes 21 in. in diameter by 5½ in. in width, which together give a total braking surface of 674 sq. in. On Model GE all brakes are 17¼ in. in diameter, the front brakes being 3 in. and the four rear brakes 4 in. in width, which gives an aggregate braking area of 720 sq. in.

A feature of the unusually wide cab is the forced ventilation system, which comprises an exhaust casing of streamlined form extending a short distance above the roof, with a motor-driven fan beneath it. There are ventilators also in the cowl. The maintenance of a pure atmosphere in the cab is further promoted by the provision of free outlets from the engine compartment. The radiator fan is 24 in. in diameter, has six blades, and is driven by two 1-in. V-belts. A fan of this size naturally moves a lot of air; part of this air can escape through six doors in the hood when they are open, while the rest is disposed of through wide spaces between the frame side rails and plates below the hood on opposite sides of the engine.



Lengthwise view from rear of heavy-duty Autocar shows compactness of unit assembly

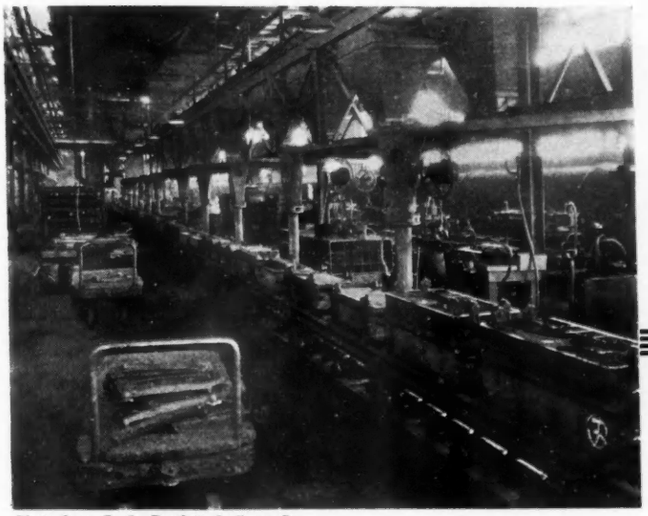


Photo from C. O. Bartlett & Snow Co.

PRODUCTION LINES

Sulphur Does It

High sulphur additions to stainless steel produces bars with remarkable free cutting performance as evidenced in a recent test. On a four-spindle Gridley automatic, drilling and cutting off standard nuts from a 5/8-in. cold-drawn hexagon bar, the highest speed attained on non-freecutting steel was 120 surface ft. per min., which dropped a finished piece from the machine every 20 sec. This speed was excessive, however, since the tooling began to break down after 12 nuts had been made. The new Carpenter Stainless No. 8 (18-8) bars were run at a surface speed of 150 ft. per min. with increased feed, dropping a nut every 10 sec. with no indication of damage to the tools. Taking high-sulphur Bessemer screw stock as 100 per cent, the Carpenter No. 8 Stainless grade was run at a production of 75 per cent, and, compared to S.A.E. 3135, the production on Carpenter No. 8 Stainless was 125 per cent.

Electrotinning Commercially

Are you interested in a positive method of producing a smooth, semi-bright, tin-plated surface? The R&H process offers an alkaline bath featuring ease of control. Details of the process, methods of control, and cleaning before plating are given in an interesting booklet just off the press. Write to the Roessler & Hasslacher Chemical Co. for it.

Getting Better

Some people have had occasion to inquire about the quality of auto sheet steel. To our mind the answer is found in the 1932 front fender designs. Consider the demands on sheet for such jobs as the Studebaker and Hudson. In addition to the usual fender crown contour, it now follows and embraces the hood ledge, front apron and radiator apron. It couldn't be done without good, soft, ductile stock.

Specify the Grade

Maybe it sounds elementary. But if you want a good plating job you should ask the steel mill for plating stock. According to our private investigation sheet steel can be supplied to meet any requirements. Providing you tell the mill where the sheet is to be used. This is particularly important in making radiator shells. For a quality job stock must be ductile, have a good surface finish, and free from surface imperfections. You can get it if you ask for it.

Coming Soon

According to a reliable informant a new wood preservative is being groomed for the market. Its most important use in the automotive field will be in the treatment of wood body parts. To meet high-speed requirements this preservative is designed as a "cold-dip" process.

It Can Be Told

Remember our article on the possibilities of sampling inspection ("Sampling Inspection Maintains Economic Levels of Quality," Automotive Industries, March 21, 1931.) Well, the complex mathematics and theoretical considerations involved in the underlying theory are thoroughly explained in a book just off the press. "Economic Control of Manufactured Product" is by Dr. W. A. Shewhart, who has spent some years on this problem. One of the most important features so far as production men and engineers are concerned is the section dealing with the five criteria for detecting controllable variations. You will also learn how to judge the value of test data and how much information is desirable. This book is valuable to everyone interested in the statistical presentation of data. It is published by D. Van Nostrand Co., Inc. Price, $6.50.

Permite Res'alum

No it's not formula. It's the name of a new aluminum paint by Aluminum Industries, Inc. Said to be good for plant and product. The paint is sold ready mixed and will cover any surface—wood, metal, fabric, stone, etc. The secret of the whole thing lies in a new vehicle which endows the paint with heat-resistant, non-corrosive and weatherproof qualities.

Correctly Pickled

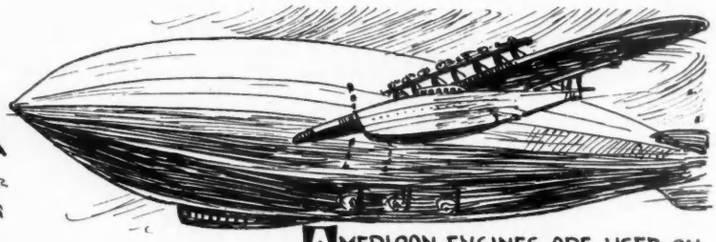
A recent development in pickling solutions provides control so that only scale, rust and oxides are removed. The base metal remains unattacked. For details of this particular method see the New Houghton Line for February, 1932.

Prosperity Ho!

Is this the beginning of the rush? One busy parts maker tells us that he is tied up waiting for new machine tools. If the machine-tool builders have not met their schedule we hope it's because they're rushed. And if they are—more power to them.—J.G.

MANUFACTURING MANAGEMENT METALLURGY

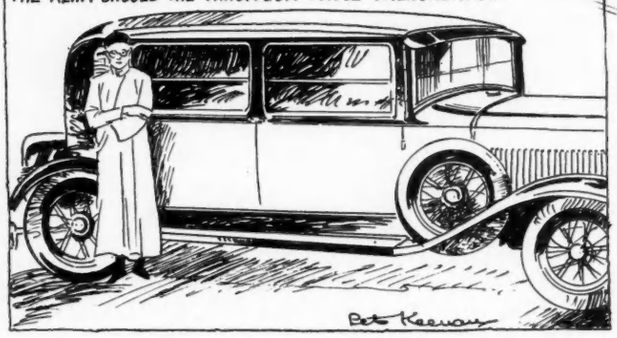
Automotive Oddities—By Pete Keenan



AMERICAN ENGINES ARE USED ON THE GERMAN DO-X AND GERMAN ENGINES ARE USED ON THE U.S.S. AKRON.

ERICH GRAICHEN INVENTED THIS CAR WHICH HE CLAIMS IS DRIVEN WITHOUT FUEL OF ANY KIND. HE REFUSED TO DIVULGE THE SECRET OF THE CARS MOTIVE POWER
Altenburg Germany, 1932.

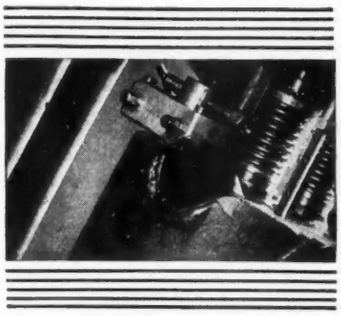
BULLET-PROOF SEDAN BUILT FOR LORD LI-CHING-MEI IN SHANGHAI, BY BILL BROS. IT HAS A LOUD PIERCING ALARM SIGNAL OPERATED FROM THE REAR SEAT. THE MOTOR CAN BE SHUT OFF FROM THE REAR SHOULD THE CHAUFFEUR PROVE TREACHEROUS.



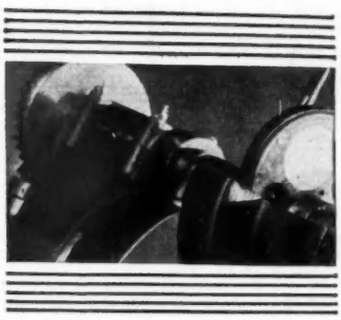
WILLIAM MURDOCK'S FIRST STEAM ENGINE RAN AWAY. THE VICAR MET THE ENGINE AND RAN INTO THE VILLAGE SCREAMING THAT THE DEVIL WAS AFTER HIM.
Cornwall, England 1784.

Do You Know An "Oddity"?

Correspondence about "Automotive Oddities" is invited. Contributions used will receive editorial mention when practicable. If you are interested in the source of, or the reason for, a particular "Oddity," ask the editorial department of Automotive Industries about it.



NEWS OF THE INDUSTRY



Hearings Begin On Couzens Bill

Flynn and Dahl Start Testimony

WASHINGTON, Feb. 3—Hearings this week before the Senate Committee on Interstate Commerce in connection with the bill of Senator Couzens, chairman of the committee, to regulate motor truck and bus operations, were devoted chiefly to testimony by Examiner Flynn of the Interstate Commerce Commission. He testified before the committee in favor of regulatory regulations which he proposed in his recent report to the Interstate Commerce Commission regarding motor and rail coordination. It appears to be the prevailing belief here that motor bus regulation possibly may be provided for by the present Congress with even less likelihood of bus regulation.

T. R. Dahl, vice-president of the White Motor Co., told the committee that Federal regulation of interstate motor truck transportation is neither practical nor in the public interest. He appeared as a member of the Motor Truck Committee of the National Automobile Chamber of Commerce. While expressing approval of interstate motor bus regulation, Mr. Dahl pointed out that in trucking only 1½ per cent of the motor vehicles in interstate commerce are regular common carriers. He stated that 85 per cent of the trucks operating are privately owned and operated and 8.7 per cent are operated under private contract.

Perfect Circle Sales

CHICAGO, Feb. 4—Sales of the Perfect Circle Co., Hagerstown, Ind., during 1931 were the largest in the 25-year history of the company, it has been announced. Sales of piston rings for 1930 were exceeded by 24 per cent, and the previous record year, 1929, was exceeded by a good margin.

THE NEWS TRAILER

High-spotting new things seen at 1932 automobile shows, a Chilton technical editor waxed warm in hearty praise of the far-sighted passenger car engineers at a recent servicemen's meeting down East. Stealthily, another Chilton technical editor rose to remark that 185 truck models have vacuum boosters; that the centrifuse type of brake drum is fairly old in the truck field; that the Packard truck used radiator guards which seem to be displacing the "fly-catcher" type of radiator grille on cars today; that only the law stops the trend to wider treads; that the Pershing punitive expedition into Mexico brought forth air cleaners on trucks even if it didn't catch up to the bold bandit Villa; that the slanting rear-axle housing gracing the new Hupp's rear end is not unlike the shaft-driven Mack design of years ago; that "X" frame members are old truck ideas; that the Ruckstall dual-ratio for Ford TT antedated the widely-praised Auburn design of 1932; that Packard's new two-piece propeller shaft is known to all truck drivers; that optional six or eight-cylinder powerplants have been used by Olds and Stewart trucks with great success; that out-rigged springs are standard truck practice; that . . . well, space is gone—but you get the idea that the rebutting technical editor knows his trucks!—L.P.

A recent bulletin of the Automotive Division, Department of Commerce, reports that Shanghai dealers in vehicles are optimistic. Maybe they're hoping the Japanese will confiscate all their used cars.

Feb. 2 saw Messrs. Ford and Chrysler seated close together at a White House dinner in honor of John N. Garner, speaker of the House of Representatives.

Roy Kerby, president of Dominion Motors, was in Lansing, Mich., Jan. 28, conferring with Durant receivers about releases on certain Durant parts which have been going into Frontenac cars made by Dominion Motors. A new larger Frontenac is scheduled to make its appearance in Canada.

We have to answer a letter from Abyssinia which states that most of Abyssinia's automotive problems evolve from the fact that the country is 80,000 [sic] ft. above sea level. But think of the fun of being able to look down on those little warts, the Himalayas—H.H.

General Motors Dividend Is Cut

Sloan Cites Lack of Business Upturn

NEW YORK, Feb. 3—General Motors Corp. has declared quarterly dividend on common stock of 50 cents a share, payable March 12 to stockholders of record Feb. 15. The company has also declared regular quarterly dividend of $1.25 on $5 preferred stock, payable May 2 to stockholders of record April 2.

In commenting upon the reduction of the common dividend rate from 75 cents to 50 cents a share, Alfred P. Sloan, Jr., president, stated that the directors felt that notwithstanding that the forecast for the current quarter indicates earnings approximately the same as a year ago, the lack of definite improvement as yet shown in the economic trend prompted a dividend disbursement in harmony with existing circumstances and conditions.

On the other hand, the importance of maintaining the impregnable financial position of the corporation during the present uncertainty was recognized, so that the board of directors felt that the new rate, which is equivalent to $2 a share per year, is desirable.

Plymouth Plans "Thrift Models"

DETROIT, Feb. 4—Reliable unofficial reports indicate that the Plymouth Motor Corp. will shortly place upon the market a two-door sedan priced at $495 and a four-door sedan at $575. These will be known as "Thrift Models" and will compare with the present two-door sedan at $575 and four-door at $635.

Soviet Orders Lincolns

DETROIT, Feb. 4 — The Russian Soviet government has ordered from the Lincoln Division of the Ford Motor Co. 130 Lincoln V-8 and V-12 cars.

Men of the Industry and What They Are Doing

Franklin Companies Elect

At the annual meeting of stockholders of H. H. Franklin Mfg. Co. held recently, the following officers were elected: H. H. Franklin, president; Edwin McEwen, vice-president; F. A. Barton, secretary and treasurer; K. F. Barton, assistant secretary and treasurer; G. H. Stilwell, chairman of board.

Directors include: H. H. Franklin, G. H. Stilwell, James S. Styron, Edwin McEwen, F. A. Barton, E. H. Dann, Ralph Murphy, John E. Williams.

Officers of the Franklin Automobile Co., the distributing branch of the business, are: H. H. Franklin, president; John E. Williams, vice-president; F. A. Barton, secretary and treasurer; K. F. Barton, assistant secretary and treasurer; R. M. Tennant, auditor.

On the board of directors of this company are: H. H. Franklin, James S. Styron, F. A. Barton, John E. Williams, Edwin McEwen.

Arnstein Returns to U. S.

Dr. Karl Arnstein of the Goodyear Zeppelin Works, designer of the dirigible Akron, arrived Jan. 31 on the S.S. Hamburg from a trip to Europe. While in Germany Dr. Arnstein visited the German Zeppelin L.Z. 129, now under construction at Friedrichshafen. He was accompanied on this trip by George Sherry, also of Goodyear Zeppelin.

Bendix Boomed for Congress

Vincent Bendix has been indorsed by Democratic leaders of the tenth (Chicago) congressional district as their candidate for Congress, Mayor Cermak announced recently. It is understood Mr. Bendix is willing to be a candidate if the Democratic organization handles the campaign in the primary and election. He is opposing Congressman Carl R. Chindblom, Republican incumbent.

Pavloski and Rex Shifted

W. L. Pavloski has been appointed manager of the Chicago zone for the Oakland Motor Car Co. During the last year he was Cleveland zone manager. He is succeeded there by George L. Rex, formerly zone manager at Philadelphia.

Oakland Names White

Robert Hugh White has been appointed advertising manager of the Oakland Motor Car Co., to succeed P. Wesley Combs, resigned. Mr. White has been advertising and sales promotion manager of the General Motors Radio Corp., Dayton, Ohio, before which he was assistant advertising manager of the Chevrolet Motor Co.

Nash Home for Birthday

Charles W. Nash, chairman of the board of Nash Motors Co., interrupted an itinerary of shows and dealer meetings to return home to spend his sixty-eighth birthday anniversary on Jan. 28 with his family. Mr. Nash took occasion to express his confidence in the "conservative but steady improvement in practically all lines of business during the year and a gradual stabilization of both public demand for manufactured goods and of its supply." He added: "One very encouraging factor in the year's outlook lies in the fact that the boom period inventories of manufactured goods are now exhausted and the slate is clean for a new start."

Heil Elects Falk

Harold S. Falk, vice-president and general works manager, Falk Corp., Milwaukee, has been elected a director of the Heil Co., Milwaukee, a leading manufacturer of body and hydraulic hoist equipment for motor trucks, according to an announcement by Julius P. Heil, president. Mr. Falk is a nephew of General Otto H. Falk, president, Allis-Chalmers Mfg. Co., and also of Herman W. Falk, president, Falk Corp., who has been a director of Heil for many years.

Motor Securities Drop

NEW YORK, Feb. 1—One hundred representative stocks declined in value during January by 2.7 per cent, according to Frazier Jelke & Co. Contributing largely to this decline were the seven motor securities included in this compilation, which declined 7.7 per cent. Electrical equipment showed a greater decline, dropping 18.9 per cent.

Of special significance in the January figures is the fact that of the 13 major classifications used in the compilation, five advanced during the month and eight of the minor classifications also showed advances.

FWD Names Bard

E. K. Bard has been appointed art engineer by Four Wheel Drive Auto Co., Clintonville, Wis. In his work with the company during the last three years he is credited with having contributed materially to the improved appearance of the present line.

Ford Announces "Midget" in England

LONDON, Jan. 30 (*by cable*)—Brief particulars of the "baby" car which is to be produced for the British market at its Dagenham plant have been released by the Ford organization. It has a four-cylinder engine of 2.23-in. bore and 3.643-in. stroke. This gives a piston displacement of 0.95 liter, or 58 cu. in., and the car is rated at 8 hp. under the British tax-rating formula. A three-speed synchronized-shift transmission is fitted, and final drive is by spiral bevel gears. The track is 45 in. and the wheelbase 90 in., while the overall length is 120 in.

The first models built have two-door, four-light close-coupled sedan bodies with what is described as an aerodynamic front and a sloping V-type radiator. The price is still undetermined, but it is probable that it will be around £125.

The sample cars shipped from Detroit have arrived in London, but they will not be shown to the public until the Ford show, which will open in the Albert Hall in London on Feb. 19. No deliveries from Dagenham are expected before May 1.

The new car compares with British models listing at from £118 to £155, though these have either a smaller engine and a shorter wheelbase or a larger piston displacement and a roomier body with four doors, six lights and a sliding roof. Thus the Standard Nine with 61 cu. in. displacement and an overall length of 131 in. sells at £155; the Singer, with 52 cu. in. displacement and with the same tread and wheelbase as the new Ford, has an overall length of 132 in. and sells at £150. The Austin Seven and the Morris Minor at £122 have a smaller engine and chassis, while the Morris Eight at £152 has similar bodywork but a smaller engine.

The new Ford undoubtedly will cut into the large British market for small cars, but it is not expected to eclipse the corresponding British production, as there is reason for believing that some British makers can appreciably reduce their current prices.

Hein-Werner Inquiries Up

WAUKESHA, WIS., Feb. 1—The Hein-Werner Motor Parts Corp. reports inquiries increasingly satisfactory, with good demand, particularly from the motor truck industry, for hydraulic jacks for original equipment. The Hein-Werner line includes 23 new models, ranging from a 1½-ton model to 30-ton capacity, according to Richard W. Werner, sales manager.

Johnson Assets Reported

NEW YORK, Feb. 1—Johnson Motor Co., in its balance sheet as of Sept. 30, 1931, shows current assets of $1,064,718, as compared with current liabilities of $818,878. Total assets as listed are $2,059,037.

November Gasoline Consumption Shows 2.1 Per Cent Rise From 1930 Figure

American Petroleum Institute Report for 46 States and District of Columbia Indicates Daily Average of 37,201,000 Gallons Used

NEW YORK, Feb. 1—Gasoline consumption in forty-six states and the District of Columbia for the month of November, 1931, as indicated by reports made by wholesalers and dealers in the various states, under provisions of the gasoline tax laws or gasoline inspection laws, totaled 1,116,042,000 gal., compared with 1,093,335,000 gal. in November, 1930, an increase of 22,707,000 gal., or 2.1 per cent, according to the American Petroleum Institute. Daily average consumption for November, 1931, was 37,201,000 gal. compared with a daily average of 40,311,000 gal. in October, 1931, a decrease in daily average during November of 7.7 per cent.

Gasoline consumption in these forty-six states and the District of Columbia for the eleven months ending with November, 1931, amounted to 12,968,637,000 gal., compared with 12,441,681,000 gal. for the corresponding period of 1930, an increase of 526,956,000 gal., or 4.2 per cent.

	Tax Per Gallon Cents	Month of Oct., 1931 Gallons	Month of Nov., 1931 Gallons	Month of Nov., 1930 Gallons	11 Months Ending With Nov., 1931 Gallons	11 Months Ending With Nov., 1930 Gallons
Alabama	5	14,026,000	13,102,000	13,037,000	150,948,000	159,147,000
Arizona	5	6,208,000	5,756,000	6,113,000	68,405,000	69,547,000
Arkansas	6	10,132,000	10,601,000	9,550,000	118,378,000	127,946,000
Colorado	4	14,985,000	12,638,000	12,793,000	166,320,000	160,367,000
Connecticut	2	22,192,000	19,242,000	17,759,000	208,579,000	206,236,000
Delaware	3	3,490,000	2,942,000	2,507,000	35,189,000	33,181,000
Dist. of Col.	2	8,508,000	7,892,000	6,761,000	85,580,000	74,095,000
Florida	7	18,218,000	17,645,000	18,625,000	210,587,000	196,478,000
Georgia	6	19,592,000	18,369,000	17,256,000	204,189,000	205,954,000
Idaho	5	5,640,000	4,398,000	4,835,000	56,075,000	57,684,000
Indiana	4	42,449,000	37,014,000	42,493,000	446,344,000	431,169,000
Iowa	3	35,224,000	30,853,000	33,600,000	385,503,000	366,445,000
Kansas	3	30,568,000	26,628,000	27,012,000	379,749,000	360,602,000
Kentucky	5	16,060,000	14,785,000	13,702,000	162,833,000	155,385,000
Louisiana	5	17,394,000	15,496,000	16,406,000	172,759,000	170,247,000
Maine	4	11,548,000	8,954,000	8,768,000	108,495,000	101,694,000
Maryland	4	17,382,000	15,765,000	14,430,000	174,326,000	168,291,000
Massachusetts	3	53,731,000	47,023,000	43,441,000	527,545,000	494,085,000
Michigan	3	70,327,000	63,948,000	63,279,000	741,224,000	735,460,000
Minnesota	3	40,067,000	34,827,000	33,179,000	414,480,000	375,856,000
Mississippi	5½	*11,221,000	*10,482,000	12,023,000	*120,756,000	125,748,000
Missouri	2	43,372,000	37,460,000	38,340,000	443,559,000	409,477,000
Montana	5	6,945,000	4,719,000	5,846,000	71,978,000	72,769,000
Nebraska	4	19,880,000	16,689,000	18,643,000	214,433,000	212,528,000
Nevada	4	2,006,000	1,776,000	1,430,000	21,109,000	17,280,000
New Hampshire	4	6,736,000	5,249,000	4,990,000	63,911,000	60,733,000
New Jersey	3	50,865,000	43,614,000	47,847,000	528,165,000	507,035,000
New Mexico	5	4,410,000	4,094,000	4,480,000	48,719,000	50,247,000
New York	2	149,129,000	131,389,000	120,377,000	1,501,931,000	1,397,738,000
North Carolina	6	24,974,000	22,498,000	22,272,000	225,039,000	228,616,000
North Dakota	3	9,629,000	7,107,000	7,559,000	110,137,000	115,938,000
Ohio	4	86,548,000	78,273,000	77,766,000	912,693,000	905,389,000
Oklahoma	5	25,138,000	25,467,000	26,511,000	283,433,000	299,062,000
Oregon	4	14,670,000	12,252,000	12,749,000	162,698,000	159,256,000
Pennsylvania	3	101,436,000	91,712,000	83,063,000	978,805,000	836,034,000
Rhode Island	2	8,597,000	7,551,000	7,995,000	90,308,000	81,962,000
South Carolina	6	10,718,000	9,852,000	10,068,000	111,449,000	109,428,000
South Dakota	4	11,129,000	9,054,000	10,546,000	127,347,000	132,451,000
Tennessee	6	19,009,000	17,821,000	16,478,000	194,593,000	198,308,000
Texas	4	70,948,000	68,512,000	61,715,000	763,782,000	736,273,000
Utah	4	4,918,000	4,794,000	4,447,000	56,966,000	56,445,000
Vermont	4	5,002,000	4,068,000	3,890,000	46,020,000	44,032,000
Virginia	5	22,955,000	20,738,000	18,340,000	224,102,000	210,397,000
Washington	5	22,483,000	22,489,000	20,531,000	255,548,000	251,204,000
West Virginia	4	14,044,000	12,479,000	11,771,000	132,629,000	130,458,000
Wisconsin	4	41,639,000	35,282,000	35,437,000	423,787,000	408,832,000
Wyoming	4	3,493,000	2,743,000	2,675,000	37,232,000	34,172,000
Total		1,249,635,000	1,116,042,000	1,093,335,000	12,968,637,000	12,441,681,000
Daily Average		40,311,000	37,201,000	36,445,000	38,828,000	37,251,000
Increase over previous year: Amount of Increase			22,707,000		526,956,000	
Percentage Increase in Daily Average			2.1%		4.2%	

* Estimated.

Magazine Linage Drop 34.8 Per Cent

Farm Periodicals Get Biggest Bump in January Shuffle

NEW YORK, Feb. 1—Expenditures by the automotive industry for advertising in national magazines and national farm magazines fell to $712,604 in January, a drop of slightly more than a third, or 34.8 per cent, from the total of $1,092,241 a year ago. Farm magazines suffered the greatest contraction, dropping 64.1 per cent from $96,429 to $34,634. In national magazines the figure was $677,970, 31.9 per cent less than $995,812 for January, 1931, according to the business survey department of Dorrance, Sullivan & Co., an advertising agency. Of the total in national magazines, $422,685, or 62.4 per cent, was spent for passenger cars and trucks; $232,088, or 34.2 per cent, went for accessories; and $23,197, or 3.4 per cent, went for tires and tubes.

Figures which have just become available covering radio broadcast advertising over national networks during December indicate that the total 1931 appropriation by the automotive industry for this medium was $1,313,923, a drop of only 3.0 per cent from 1930. This decline compares with a drop of 16.6 per cent for the composite total for the year in national magazines, farm magazines, and radio, which amounted to $20,497,153 as compared to $24,580,632 in 1930. In December the radio figure was $162,949, 16.4 per cent ahead of $139,951 in December, 1930.

Newspaper "show" schedules so far released in eastern cities are reported to be larger than similar schedules released in January, 1931. No comparative figures are generally available except for New York where the increase over 1931 "show" schedules was 23,249 lines.

A. O. Smith Payrolls Up

MILWAUKEE, Feb. 1—Modern improvement in the number of days and hours worked is reported for the automobile frame division of the A. O. Smith Corp. The force at present approximates 4000. While no additional men were employed in the frame division, the recent spurt in automobile production made possible a larger payroll for the department, due to the increase in hours worked.

Olds Production Gains

LANSING, MICH., Feb. 6—A 60 per cent increase in production of 1932 Oldsmobiles over the 1931 cars during the same period last year is reported by officials of Olds Motor Works. Retail sales are reported to be keeping pace with the increased production schedules.

Value of Aircraft and Engines Sold in 1931 Decreased 8.2 Per Cent

NEW YORK, Feb. 3—Sales of commercial and military aircraft, engines and spare parts in 1931 decreased 8.2 per cent in dollar volume from 1930 levels, it was revealed today in a report compiled by the Aeronautical Chamber of Commerce of America, Inc., for publication in "The Aircraft Year Book for 1932," which will come from the press Feb. 20.

"The value of all aircraft, engines and parts sold in 1931 totaled $49,096,866, as compared with $53,465,675," the annual report in "The Aircraft Year Book" will say. "The sale of commercial aircraft, engines and parts fell off from $24,876,327 in 1930 to $16,660,231 in 1931, a decrease of 33 per cent, while military sales increased from $28,589,348 in 1930 to $32,436,635 in 1931, a rise of 13.4 per cent. The importance of the military and air transport markets dominated throughout 1931, keeping many factories active.

"Sales more than kept pace with production throughout 1931 in both the commercial and military fields, indicating a healthy inventory condition at the opening of 1932. The report shows that aircraft production, considering military and commercial planes together, fell off about 300 units during 1931 from 1930 levels, with a consequent reduction of about $2,000,000 in the value of aircraft produced. Fifty-two American aircraft manufacturers reporting their production to the Aeronautical Chamber of Commerce listed 2394 commercial and military aircraft manufactured during 1931 as compared with 2684 units in 1930. Planes sold during 1931 totaled 2469 as compared with 3125 units in 1930.

"In the commercial field 1582 aircraft were built and 1658 were sold during 1931," the report reveals. "In the military field 812 planes were manufactured and 811 were delivered to the government on contract. The number of military planes produced during 1931 represented an increase of 65 over the 747 manufactured in 1930, and an increase of 135 over the 677 produced in 1929. The commercial field showed a further curtailment of production when the 1582 planes manufactured in 1931 were compared with 1937 in 1930 and 5357 made in 1929.

"While commercial production in 1931 was almost twice as large as military production in number of units manufactured, the importance of the military market is seen in the fact that the value of military aircraft produced was almost twice that of commercial production. The manufacture of a large number of low-powered light airplanes during the year to sell at less than $1,800 accounted for commercial production even reaching the 1582 unit figure.

"The total value of aircraft produced by American manufacturers during 1931 was $19,626,766, as compared with $21,469,763 in 1930, and $44,457,300 in 1929. Sales in 1931 totaled $20,873,588, as compared with $22,938,552 in 1930, the first year in which sales statistics were compiled. Commercial airplanes produced during 1931 were valued at $6,655,738, as compared with $10,746,043 in 1930. Military airplanes manufactured in 1931 were valued at $12,971,028 as compared with $10,723,720 in 1930. Commercial sales in 1931 were reported at $7,656,827, as compared with $11,666,209 in 1930. It was considered significant that sales more than kept pace with production throughout 1930 and 1931, making it possible for manufacturers to deplete their stocks, built up through overproduction in 1929. Military sales in 1931 totaled $13,216,761, as compared with $11,272,343 in 1930. All figures given here for aircraft are for units without engines.

"Aircraft engine production in 1931 showed a slight increase over 1930 in the number of units manufactured, but experienced a sharp decrease in total value. The increased number of low-powered and low-priced engines built for light airplanes in the commercial field during 1931 accounted for keeping the number of units at the 1930 level, while the total value of engines produced declined sharply. Engine sales during 1931 more than kept pace with production, to indicate a healthy inventory condition.

"Commercial and military engines manufactured during 1931 totaled 3776 units, valued at $14,609,949, as compared with 3766 units, valued at $17,078,916, in 1930. Aircraft engine sales in both commercial and military fields for 1931 totaled 3836 units, valued at $15,263,553, as compared with 3846 units, valued at $17,268,219, in 1930.

"Commercial and military production was fairly evenly divided in 1931 if units alone were considered, but the military market represented more than twice the value of the commercial market. Commercial production totaled 1976 units, valued at $4,192,231, as compared with commercial sales of 2009 units, valued at $4,576,012. Military production totaled 1800 engines, with a value of $10,417,718, as compared with military sales of 1827 units, valued at $10,687,541."

Lawrance Articles Reprinted

NEW YORK, Feb. 1—A series of articles by Charles L. Lawrance, president, Aeronautical Chamber of Commerce, Inc., on the general subject of "Our National Aviation Program" has been collected in book form and issued with the imprint of the Chamber.

Hupp Ships 1049

DETROIT, Feb. 2—Hupp Motor Car Corp. shipped 1049 cars in January compared with 1044 in December and 1561 in January last year.

French Trade Bodies Merge

The two associations of automobile and cycle manufacturers in France which have been in existence for several years under the leadership,. one of André Citroen, and the other of M. Bozier, have been merged with the Federation Nationale de l'Automobile, du Cycle, de l'Aeronautique et des Transports, according to Trade Commissioner W. L. Finger, Paris, in a report to the Department of Commerce.

This absorption by the National Federation of the two individual groups is in accordance with a suggestion made by the Minister of Commerce at the time when the French tariff on automobiles was increased in April, 1930, and repeated by him during the automobile salon in October of the same year. The government expressed the view that a greater centralization in automotive production and in the trade associations should result in more efficient methods and should enable the French to compete more successfully with foreign manufacturers.

The reorganization of the associations and the grouping of the seven different syndicates within the Federation Nationale de l'Automobile, du Cycle, de l'Aeronautique et des Transports, was arranged by common agreement among the directors of the various groups. The different syndicates or trade associations included in the National Federation are as follows:

1. Syndical Chamber of Automobile Constructors.
2. Syndical Chamber of Body Builders.
3. Syndical Chamber of Motorcycle and Bicycle Manufacturers.
4. Syndical Chamber of Automotive Agricultural Equipment.
5. Syndical Chamber of Aeronautical Industries.
6. Syndical Chamber of Manufacturers of Parts and Accessories.
7. Syndical Chamber of Automobile Transport.

The address of the National Federation is 59 Avenue Hoche, Paris.

New York Plans Taxes

NEW YORK, Feb. 3—A bill has been introduced into the New York State Legislature calling for a complete revision of the whole tax system of the state. This bill calls for slightly higher taxes on registration fees on passenger cars and for radically increased fees for trucks.

In the truck field, the registration fee on light trucks shows a slight increase over the existing fees, but increases rapidly as the weight increases, so that the heaviest trucks would pay approximately four times the present rate.

The bill also calls for a doubling of the gasoline tax from the present rate of 2 cents a gallon to 4 cents a gallon.

Noah C. Rogers

NEW YORK, Feb. 3—Noah C. Rogers, general counsel for the National Automobile Chamber of Commerce, died suddenly at his desk in his office at 1 Wall Street yesterday. Mr. Rogers has been counsel for the National Automobile Chamber of Commerce since the death of Charles Thaddeus Terry.

He was a member of the law firm of Merrill, Rogers, Gifford & Woody. He was 46 years old at the time of his death, which was caused by a cerebral hemorrhage. He is survived by a widow, one son and three daughters.

Auburn Ships 2508

AUBURN, IND., Feb. 3—January car shipments of the Auburn Automobile Co. totaled 2508, E. L. Cord, president, announced today. This figure compares with 2017 cars shipped in January, 1931, and represents an increase of slightly more than 24.3 per cent.

Of the total cars built and shipped during January, more than 59 per cent were custom models, equipped with Dual Ratio, he said. Convertible models represented approximately 27 per cent of the total.

Rubber Shipments Up

NEW YORK, Feb. 2—Shipments of crude rubber from Malaya during January totaled 42,658 tons, according to the Rubber Exchange of New York. This compares with 35,741 tons exported during December. Exports from Ceylon were 4568 tons, as compared with 6891 tons in December.

Dealers Discuss Contracts

CHICAGO, Feb. 3—Revision in the dealer contract proposed by C. A. Vane, general manager of the association, were approved unanimously at the annual convention of the National Automobile Dealers Association held here on Monday and Tuesday of Show Week. The association also requested the manufacturers to fix a conference to discuss these proposed revisions or substitutes for them. The association headquarters also was authorized to investigate cancellations of dealer contracts, either on the request of the dealer cancelled or on its own initiative and to publish its finding. In addition a resolution condemning the proposed Federal Excise Tax was adopted unanimously. Floris T. Naglevoort, Seattle, Wash., was elected president of the association for the ensuing year.

Graham Ships 2537

DETROIT, Feb. 2 — Graham-Paige Motors Corp. has reported shipments of 2537 cars in January, an increase of 486 or 23½ per cent over last year, and the largest total for January since 1929. Virtually all the cars shipped were the new Blue Streak eight, bringing the total for this model since its introduction in December to 3658, as against 2200 new models shipped to the end of January a year ago, a gain of 60 per cent in units and 71 per cent in dollar value, which totals over $3,900,000.

Retail deliveries for the week ending Jan. 23 were 35 per cent over the preceding week and 52 per cent better than the corresponding week last year.

Auburn Adds Dealers

AUBURN, IND., Feb. 4—An increase of more than 52 per cent in the dealer-distributor organization of the Auburn Automobile Co. during the last year was reported today by N. E. McDarby, vice-president in charge of sales. On Feb. 1, 1932, Auburn had more than half again as many dealers as on the same date in 1931, he said.

Montreal Show Successful

MONTREAL, Feb. 2—Canada's largest automobile exhibition, the Montreal Motor Show, was concluded Saturday night after the most successful six days' showing in its history. All previous attendance records were broken, while sales and prospects were equal if not better than those of 1928-29, the peak years of the automobile industry.

Seventy-five thousand people attended the exhibition during the past week and spent approximately $500,000 for new automobiles, it is estimated.

Chrysler Imperial Prices Are Set

DETROIT, Feb. 2—Below are prices on 1932 Chrysler Imperial Custom Eights.

Phaeton	$3,395
Convertible coupe-roadster	3,295
Convertible sedan	3,595
Close-coupled sedan	2,895
Seven-passenger sedan	2,995
Sedan limousine	3,295

Detroit Attendance Totaled

DETROIT, Feb. 2—Admissions to the Detroit automobile show last week totaled 149,587, compared with 126,571 last year.

Petroleum Imports Reported

NEW YORK, Feb. 3—Imports of petroleum at the principal ports of the United States for the week ended Jan. 30 have been estimated by the American Petroleum Institute at 230,714 bbl. daily. This compares with the daily average of 241,429 bbl. for the week ended Jan. 23, and with 216,857 bbl. daily for the four weeks ended Jan. 30.

Crude runs to stills during the week are placed at 2,110,600 bbl. daily. Cracked gasoline produced during the week was placed at 2,962,000 bbl.

Stocks of gasoline at bulk terminals and in transit, east of California, for the week ended Jan. 30, totaled 13,455,000 gal., as compared with 13,298,000 gal. for the previous week, and with 12,372,000 gal. for the week ended Jan. 31, 1931.

Baltimore Attendance Up

BALTIMORE, Feb. 4—The Baltimore automobile show, under the auspices of the Maryland Automobile Trade Association, which closed on Saturday at the Fifth Regiment Armory, set a new high mark for attendance. Interest in the new models also was good and it is expected that some good business will result.

The show was visited by almost 75,000 persons, more than 60 per cent above the attendance mark of last year.

G. M. Savings Fund Matures

NEW YORK, Feb. 5—"General Motors Corp. is distributing $7,862,459 to 30,222 of its employees who invested in the saving and investment fund class of 1926, which matured Dec. 31, 1931," Alfred P. Sloan, Jr., president of the corporation, announced today. 50 per cent more employees are sharing in the distribution this year than a year ago. The present settlement of $7,862,459 consists of $4,923,341 in cash and 129,905 shares of General Motors common stock valued at the year-end market price.

Cierva, Mueller Sail

Juan de la Cierva, inventor of the autogiro, who has been in this country for some time, sailed Feb. 3, aboard the Bremen to return to Europe. Otto Mueller, manager of the London office of the Edward G. Budd Mfg. Co., also sailed on the Bremen, accompanied by Mrs. Mueller.

Caterpillar Reports Profit

NEW YORK, Feb. 3—Caterpillar Tractor Co. and subsidiaries in a preliminary report for 1931 show a net profit of $1,361,200. This is equivalent to 72 cents a share on capital stock, and compares with earnings of $8,714,801 or $4.63 a share in 1930.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, Feb. 3—There were no signs of material improvement in general business last week, and normal winter weather is badly needed in many lines of retail trade. There was no pronounced change for the better in the heavy industries. Collections remained slow. The volumes of retail sales during January are believed to be below those a year ago.

RAILWAY WAGES

After 17 days of negotiations an agreement was signed on Jan. 30 by 30 labor unions and 210 Class 1 railways that will reduce the salaries of 1,200,000 railway workers by 10 per cent for a period of one year. It is estimated that the railways will save about $215,000,000 by this agreement.

CAR LOADINGS

Railway freight loadings during the week ended Jan. 16 totaled 573,276 cars, which marks an increase of 772 cars above those during the preceding week, a decrease of 118,477 cars below those a year ago, and a decrease of 273,879 cars below those two years ago.

COST OF LIVING

The cost of living during December was 3 per cent lower than in June, 1931, and 9.3 per cent below that a year ago, according to the Bureau of Labor statistics. Retail food prices in 51 cities in the United States on Dec. 15 were about 2 per cent lower than those a month earlier, and 16 2/3 per cent lower than those a year earlier.

LIFE INSURANCE SALES

Sales of ordinary life insurance during December were 1 per cent above those a year earlier. Every section of the country showed an improvement in December from the levels of insurance business in the 11 months preceding, while sales increased above those in December, 1930, in 17 states.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended Jan. 30 stood at 64.5, as against 65.2 for both the week and two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City during the week ended Jan. 27 were 26 per cent below those a year ago.

STOCK MARKET

The stock market last week was irregularly lower. Weakness developed with further dividend reductions and omissions, particularly with the reduction of the quarterly dividend on United States Steel common to one-half of 1 per cent. The directors of this company issued a statement to the effect that $43,400,000 was taken from surplus during 1931 to pay dividends, and that a continuance of dividends must depend on an improvement in the company's business.

RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended Jan. 27 showed increases of $19,000,000 in holdings of discounted bills and of $1,000,000 in holdings of government securities. Holdings of bills bought in the open market decreased $26,000,000. The reserve ratio on Jan. 27 was 67.4 per cent, as against 67.3 per cent a week earlier, and 66.9 per cent two weeks earlier.

A.C.C. Elects Lawrance

NEW YORK, Feb. 1—Charles L. Lawrance, president of the Aeronautical Chamber of Commerce of America, Inc., was reelected to the office at the annual meeting held late last week.

Governors elected at this meeting include: C. J. Brukner, Waco Aircraft Co., Troy, Ohio; F. G. Coburn, the Aviation Corp., New York; T. B. Doe, Eastern Air Transport, New York; J. M. Eaton, Ludington Airlines, Inc., Philadelphia; S. M. Fairchild, Fairchild Aviation Corp., New York; J. C. Hunsaker, Goodyear-Zeppelin Corp., Akron, Ohio; W. B. Hurlburt, Bellanca Aircraft Corp., New Castle, Del.; P. G. Johnson Boeing Air Transport, Seattle; L. B. Manning, Century Air Lines, Inc., Chicago; W. B. Mayo, Ford Motor Co., Detroit; T. A. Morgan, Curtiss Aeroplane & Motor Co., New York; R. W. Robbins, Transcontinental & Western Air, Los Angeles; J. M. Schoonmaker, Jr., General Aviation Corp., Baltimore; J. T. Trippe, Pan American Airways, Inc., New York; G. S. Wheat, Pratt & Whitney Aircraft Co., Hartford.

Governors elected an executive committee of seven, headed by President Lawrance, to actively direct the Chamber's affairs during the coming year, including F. G. Coburn, Jerome C. Hunsaker, Grover Loening, Thomas A. Morgan, James M. Schoonmaker, Jr., and George S. Wheat.

Studying Johnson Bill

NEW YORK, Feb. 1—The Traffic Committee of the National Automobile Chamber of Commerce is studying the Johnson Bill introduced into the United States Senate and sponsored by the Shipping Board.

This bill would provide a certificate of public necessity required from the board in order to inaugurate interstate shipping service, and that ships owned by and carrying a manufacturer's goods could not engage in interstate commerce as a common carrier. The bill would also provide that the Shipping Board have authority to fix minimum rates in both foreign and interstate commerce on its own motion, or on complaint that any carrier is making unduly low rates. Maximum rates could also be prescribed.

The National Automobile Chamber of Commerce Traffic Committee is trying to determine the effect of this bill, if passed, upon the shipping of the industry.

Nash Orders Supplies

NEW YORK, Feb. 1—Nash Motors Co. has placed a number of large orders for materials for construction of the new lines to be announced about March 1. Shipments of these materials have already been arriving at the Nash factories, and production activities are getting under way at a satisfactory pace.

Couzens Bill Hearings Planned

Michigan Senator's Proposal Eliminates Certificate for Trucks

WASHINGTON, Feb. 1 — Hearings begin today before the Senate Committee on Interstate Commerce on the bill of the committee's chairman, Senator Couzens of Michigan, for the regulation of motor buses in interstate commerce. The National Association of Railroad and Utilities Commissioners will urge Federal regulation. Determination to make this presentation through the legislative committee and special committee on motor vehicle regulation of the association was reached at meetings of the committee here on Jan. 25 and 26. The purpose to ask for Federal regulation of motor buses and trucks was announced by General Solicitor John E. Benton of the association. Mr. Benton said the State Commissioners, as represented by the committees, think trucks should be controlled to the same extent and in substantially the same manner as buses.

The Couzens bill calls for complete regulation of interstate buses along the lines provided in the Parker bill which passed the House at the last session. The Couzens bill, however, supplements this plan with a provision for permits for interstate trucks, without requiring a certificate of public convenience and necessity. It also makes no provision for control of rates.

The Legislative Committee of the association is headed by Andrew R. McDonald of the Wisconsin Public Service Commission. The Special Committee on Motor Vehicle Legislation is headed by J. Paul Kuhn of the Illinois Commerce Commission.

Rockford Show Draws 14,000

CHICAGO, Feb. 1—A total of 14,681 persons attended the Rockford, Ill., auto show, which closed last week. Sales were reported larger than in any previous year.

Illinois Car Sales Valued

CHICAGO, Feb. 1—Residents of Illinois spent approximately $90,154,485 for new automobiles in 1931, a per capita outlay of less than $12, Illinois Chamber of Commerce figures reveal.

Flying Courses Cheaper

NEW YORK, Feb. 1—Curtiss-Wright Flying Service has reduced the cost of flying courses at its 30 bases. In some cases these reductions amount to as high as 35 per cent.

White to Sell An Indiana Line

Assembled Trucks Will Supplement Its Own Models

CLEVELAND, Feb. 1—A contract agrement has been entered into by which the White Co. will market through its factory branch and dealer organization Indiana assembled trucks. A. G. Bean, president of the White Co., in making the announcement, said that the agreement was solely a merchandising program and does not alter the engineering or manufacturing policies of either company.

Effective immediately through this contractual agreement, the Indiana 95 truck series, of one to two-and-one-half-ton trucks, assembled in three models, will be merchandised through the White sales organization. These models are the Model 95, 12,000 lb. gross, $1,095; Model 95 DR, 15,000 lb. gross, $1,275; Model 95 SW, a six-wheel unit, 20,000 lb. gross, $1,450.

"For some time the White Co. has been planning to utilize its sales branches to market a low priced assembled truck of good make," Mr. Bean said.

"A long and careful investigation of the various low priced assembled trucks was made for the purpose of finding a vehicle suitable to meet certain operating conditions. This resulted in the selection of the assembled trucks produced by the Indiana Motors Corp., of Marion, Ind., as the product best qualified to be sold in conjunction with the White line.

"This procedure will permit the White Co. to offer a low priced assembled truck where such a vehicle is adaptable."

Flynn Recommendations Opposed

NEW YORK, Feb. 2 — Directors of the National Automobile Chamber of Commerce have decided to oppose vigorously the recommendations for federal regulation of motor trucks as proposed by Examiner Leo J. Flynn, in his preliminary report to the Interstate Commerce Commission.

The Chamber will base its opposition on the five following principal factors:

1. No demand from consumers and the shipping public.
2. Less than 2 per cent of trucks would be affected.
3. Would increase shipping costs to public.
4. Railroad desire to shackle competitors unfair and not in public interests.
5. Federal regulation premature until experiments with such laws in states have demonstrated:

a. That they are constitutional.

b. That they are practicable and can be enforced.

c. That the trucker gets protection from competition in return for expensive red tape.

d. That substantial advantages in economy or security would accrue to the shipper.

e. That dividends to the public upon its highway investment will not be eliminated by forcing traffic more economically handled by road, back to the rails.

Gets Autogiro License

PHILADELPHIA, Feb. 1 — Production of an entirely new line of autogiro aircraft is foreshadowed in the appointment of the F. W. Steere Co., now of White Plains, N. Y., as a licensed manufacturer of the Autogiro Co. of America. The Steere company's manufacturing facilities will be established in the Middle West.

F. W. Steere, head of the concern, is a former public utilities executive and organizer of the Steere Engineering Co. of Detroit. Heading the technical department of the concern will be Heraclio Alfaro as vice-president and chief engineer.

The F. W. Steere Co. is the fourth to enter the autogiro field, the other concerns being the Buhl Aircraft Co. of St. Claire, Mich.; the Kellett Aircraft Corp. of Philadelphia, and Pitcairn Aircraft, Inc., of Willow Grove, Pa.

Petroleum Imports Up

NEW YORK, Feb. 1 — Imports of petroleum at the principal ports of the United States for the week ended Jan. 23 have been estimated by the American Petroleum Institute at 220,286 barrels daily. This compares with the daily average of 205,429 barrels for the week ended Jan. 16, and with 216,143 barrels daily for the four weeks ended Jan. 23.

Crude runs to stills during the week are placed at 2,142,100 barrels daily. Cracked gasoline produced during the week was placed at 2,978,000 barrels.

Stocks of gasoline at bulk terminals and in transit, east of California, for the week ended Jan. 23, totaled 13,298,000 gallons, as compared with 13,273,000 gallons for the previous week, and with 11,929,000 gallons for the week ended Jan. 24, 1931.

Continental Elects Beall

DETROIT, Feb. 2—At the directors' meeting recently, F. F. Beall, formerly vice-president in charge of manufacturing, Packard Motor Car Co., was elected vice-president and member of the executive committee of Continental Motors. Mr. Beal was one of the organizers of the Gray Motor Car Co. and for the past year has been a director of Continental.

Cord Income 26 Cts. a Share

Company's Aviation Subsidiaries Occupy Strong Position

CHICAGO, Feb. 1—Consolidated net income of the Cord Corp. for the fiscal year ended Nov. 30, 1931, amounted to $582,788 after all charges including depreciation and Federal taxes and after adjustment of minority interest. This is equal to 26 cents a share on 2,260,000 shares of $5 par capital stock outstanding.

In the preceding fiscal year the company had a consolidated net profit of $1,477,477, or 65 cents a share on the same capitalization. This decline is due to unusual expense in connection with the development of new products.

The balance sheet as of Nov. 30, last, reveals a strong financial position with cash and marketable securities, principally government securities of $4,762,574. Current assets were $5,983,677 as against current liabilities of only $484,541.

Investments are carried in the balance sheet at $6,448,991. Stocks of affiliated companies totaled $6,406,291, including $5,418,111 of listed stocks, the market value of which on Nov. 30, last, was $9,304,231. On Jan. 27, 1932, the market value of these listed stocks was $11,567,360. Unlisted stocks carried in the investment account in the amount of $988,180 had a book value on Nov. 30, 1931, of $2,092,000. Earned surplus increased to $2,304,432 and total assets at the end of the fiscal year were $16,060,394.

President's Report

In a report to stockholders, E. L. Cord, president of the Cord Corp., states:

"Your management's aviation program started four years ago, involving the design, development and manufacture of airplanes and engines and the development of transportation systems, now results in your company's subsidiaries being the largest manufacturers of commercial cabin airplanes in the world and the transportation division flies one-eighth of all the scheduled air miles and carries one-fourth of all the passengers traveling by air in America.

"Another manufacturing division, L. G. S. Devices Corp., though it encountered considerable loss last year, due to an intensive development program and the resultant expense, is now operating twenty-four hours a day and delivering approximately 75,000 spring clutch automatic free-wheel units per month to the industry, thereby making it the largest manufacturer of free-wheel units in the country."

Chicago Crowd Below N. Y. Mark

But Show Brings Out Many Prospects and Progress is Made

CHICAGO, Feb. 1—Opening of the Chicago National Automobile Show on Saturday found factory executives reasonably well satisfied with the sales progress which had been made during January. Buying opened up in several important lines following the New York show after having started off at low levels during the first few days of the month.

While sales of many important makes have been equal to or above the levels of 1931 for the last two weeks of January, it is practically certain that final figures will show January totals this year to have been behind those of last.

Clear, cold weather greeted the opening of the Chicago show. Attendance in the early hours of Saturday afternoon must have been well below that recorded by the avalanche of humanity which burst into the New York exhibit when its doors were opened this year. Thousands of interested people poured through the turnstiles, however, and salesmen were busy with specifically interested prospects before the show had been under way more than an hour.

Prices and models practically duplicated those of the New York exhibit, although rumors of downward revisions in some lines were afloat. The imminence of more important new models within the next 60 to 90 days, indicated in these columns three weeks ago, was confirmed by further investigations in Chicago. Important revisions in at least three or four of the lines on display at this show probably will take place within that time.

Peerless Reports Loss

CLEVELAND, Feb. 1—Net loss of $712,743 for the fiscal year ending Sept. 30, 1931, is shown in the current pamphlet report of the Peerless Motor Car Corp. Operating loss accounted for $427,321 of this amount. Tooling and experimental costs were charged at an additional $243,809, and provision was made to cover shrinkage in value of listed stock and possible loss on other securities owned, these items being charged at $107,789. Among its assets the company reported cash items amounting to $1,088,172, and securities with a market value of $273,407. Land, buildings and equipment were appraised at $3,441,100 for the report.

Officers of the Peerless Motor Car Corp. are now as follows: J. A. Bohannon, president; J. H. R. Cromwell, vice-president; David Beecroft, secretary, and R. E. Wilcox, treasurer. Directors are: David Beecroft, J. A. Bohannon, Caleb Bragg, J. H. R. Cromwell, Alfred Fritzsche, C. E. Sullivan and R. E. Wilcox. The directorate reflects representation of heavy stockholdings in the corporation by Vincent Bendix, it has been pointed out.

+ + CALENDAR + + OF COMING EVENTS

SHOWS

National Automobile, Chicago, Jan. 30-Feb. 6
Salon, Chicago .....Jan. 30-Feb. 6
Washington, D. C., Automobile Jan. 30-Feb. 6
Cleveland, Automobile ....Jan. 30-Feb. 6
Grand Rapids, Mich., Automobile, Feb. 1-6
Springfield, Ill., Automobile.....Feb. 4-6
Plainfield, N. J., Automobile.....Feb. 6-13
St. Paul, Minn., Automobile ....Feb. 6-13
St. Louis, Automobile.....Feb. 7-13
Denver, Colo., Automobile.....Feb. 8-13
Indianapolis, Ind., Automobile..Feb. 13-19
Salon, Los Angeles, Calif.....Feb. 13-20
Kansas City, Automobile.....Feb. 13-20
Mankato, Minn., Automobile...Feb. 17-20
Peoria, Ill., Automobile.....Feb. 17-21
Holyoke, Mass., Automobile...Feb. 18-22
Des Moines, Iowa, Automobile..Feb. 21-26
Wichita, Kan., Tractor and Power Equipment .....Feb. 23-26
Salon, San Francisco, Calif..Feb. 27-Mar. 5
Albany, N. Y., Automobile..Feb. 27-Mar. 5
Berne, Switzerland, Automobile.Mar. 11-20
National Aircraft, Detroit, Mich..Apr. 2-10

FOREIGN SHOWS

Copenhagen, Automobile ..Feb. 26-Mar. 6
Lyons, France, Passenger and Commercial .....Mar. 7-20
Geneva, Switzerland, Passenger and Commercial .....Mar. 11-20
Vienna, Passenger and Commercial .....Mar. 13-20
Tel Aviv, Palestine (Levant Fair) .....April 7-30
Milan, International Automobile Salon .....April 12-27
Zagreb, Jugoslavia, Automobile Salon .....April 23-May 2
Peznan, Poland, International Fair .....May 1- 8
Dublin, Commercial .....May 4- 7
Budapest, International Fair...May 7-16
Belfast, Commercial .....May 25-28
Bordeaux, Fair .....June
Cork, Commercial .....June
Inverness, Commercial .....June 21-24
Southampton, Commercial .....July 5- 9
Llandrindod, Wales, Commercial .....July 20-22
London, Olympia Show .....Oct. 13-22
Glasgow, Scottish Motor Show..Nov. 11-19

CONVENTIONS

American Institute Mining & Met. Engineers, Meeting, New York City, Feb. 15-19
American Welding Society, Annual Meeting, New York City.....Apr. 27-29

Steel Demand Steadies Off

Ford Buying May Boost Demand for Sheet Items, is View

NEW YORK, Feb. 4—Steel demand from motor vehicle manufacturers and parts makers is well maintained without, however, showing any marked bulge. A good deal of the business comes to mills in the form of telegrams urging shipment with as little delay as possible. Chicago and Cleveland district mills fare somewhat better in the matter of orders than those of the Pittsburgh and Buffalo districts. Rolling mills in the Youngstown district are holding their own. In some descriptions of steel products, especially so in wire material, the obvious economies of carload freight rates are helpful in correcting excesses in small-lot buying. The tone of the sheet market continues easy, but in full-finished automobile sheets a gradual strengthening of prices is being achieved through rollers withholding from the market off-grade material that, through reassorting by second hands, was made to compete with direct shipments of primes.

The possibility of marked expansion in sheet demand through Ford buying continues to be a much-discussed market topic. Strip steel is steadier, the hot-rolled being quoted at 1.40@1.50 cents, Pittsburgh, and the cold-rolled at 1.95 cents, Pittsburgh. Small orders carry slightly better prices. While important merchant bar buyers enjoy protection at around 1.45 cents, the market for steel bars as a whole is more nearly on a 1.50@1.55 cent, Pittsburgh, basis. Demand for automotive alloy steels is fair. Bolts and nuts are easy. Detroit warehouse business is reported as indicating continued conservative buying on the part of most of the medium-sized automotive plants.

Pig Iron—Here and there slightly heavier shipments to automotive foundries are reported, but on the whole melters are not taking on any more material than called for by their current casting schedules. The market generally is easy, with foreign competition tending to hold prices down near the Atlantic seaboard, and rivalry among blast furnace owners in different sections of the Middle West doing the same thing for inland markets.

Aluminum—Takings of Detroit and Cleveland automotive foundries are along routine lines. The market generally is quiet.

Copper—Small producers are offering electrolytic at 6¾ cents, delivered Connecticut Valley. Custom smelters are striving to cut down accumulations. Much of what little domestic demand there is comes from fabricators working on automotive orders.

Tin—Quiet, with spot Straits selling at 22.10 cents at the beginning of the week.

Lead—Demand light. Market easy.

Zinc—Sales at 2.85 cents, East St. Louis, recorded a new low for zinc.

A STEEL ARTILLERY WHEEL

LIGHTER! . . . STRONGER! . . . MORE BEAUTIFUL!

Here is a wheel that is not only lighter than an equivalent wood wheel . . . not only stronger . . . but every inch a masterstroke of beauty. A gleaming wheel! A graceful wheel! A wheel that complements the lines of today's automobile.

This beautiful wheel is made in low-carbon steel, and in stainless steel. In low-carbon steel, it can be finished in any of the new lacquers to match or contrast with the body finish. And finishing this wheel is a matter of hours instead of days.

In stainless steel it will harmonize with, and enrich, any color scheme.

This wheel has already been adopted by leading makes. It is on display at the Budd plants in Detroit and Philadelphia. May we show it to you and tell you more about it?

BUDD WHEEL COMPANY

Detroit Philadelphia

Makers of BUDD-MICHELIN WHEELS

★WHEELS BY BUDD★

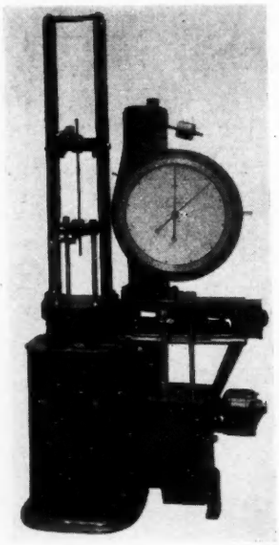
NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Olsen Hydraulic Type Testing Machine

A new type of hydraulic universal testing machine is being offered to the industry by the Tinius Olsen Testing Machine Co. of Philadelphia, Pa.

This machine combines the flexibility of the hydraulic loading system with the convenience of dial reading and the high accuracy possible with dial indicating mechanism. The dial is not hydraulic, but is mechanically operated through levers and a pendulum. The dial is large and the pointer can make two complete revolutions, hence the scale is very large.



The loading system consists essentially of an hydraulic cylinder and piston located in the base of the machine; the piston being connected to the four straining rods shown attached to and terminating at the moving crosshead gripping the lower end of the tension specimen. As the pressure in the hydraulic cylinder is increased, the lower crosshead moves down, and tension load is applied through the specimen to the upper adjustable crosshead and thence downward through the two side columns to the weighing table, which latter does not touch the four straining rods or any part of the straining system.

The weighing table rests on knife edges in levers. Through a system of levers the load is transmitted to a pendulum on the back of the upright housing at the rear of the dial. The movement of this pendulum is shown by the pointer on the dial, which latter gives directly the number of pounds load being applied to the test specimen. On the dial are two pointers, one of which moves forward or backward constantly as the load is being increased or reduced. The second pointer is drawn forward by the first pointer and always indicates the maximum load which has been applied to the specimen. The yield points are thereby shown clearly, and when the specimen breaks, the second pointer remains at the breaking load until it is set back by the operator.

The knurled handle at the front of the lever housing controls the up and down movement of the lower crosshead. The knurled handle on top of the lever housing under the dial is marked so that it may be set at various positions to regulate the "inches per minute" travel of the crosshead up or down. Automatic regulation is provided so that as the load is increased, the rate of travel of the crosshead is maintained.

Provision is made for a quick return of the crosshead to the top of its stroke, where it is ready for the next test.

The machine has direct motor drive and has a capacity of 20,000 lb.

Natco Hydraulic Driller

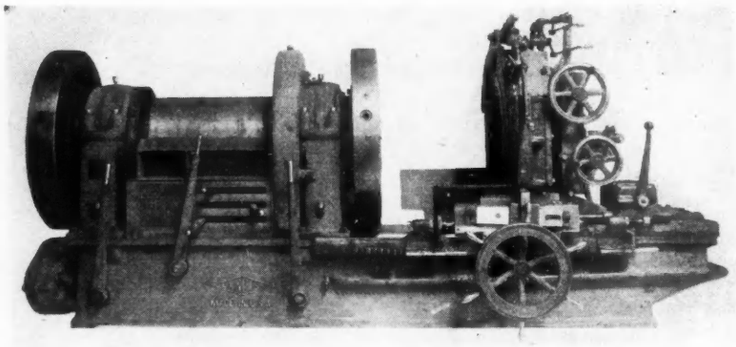
Increased production and lower operating costs are claimed for the NATCO model B14H hydraulic drilling machine recently developed by the National Automatic Tool Co. of Richmond, Ind. The machine is especially designed for fixed center multiple drilling. An important feature is that the various cluster boxes are easily changed to suit each individual job. Hydraulic feeding pressure is supplied by a high pressure volumetric pump. The control is centralized, the machine being operated by a single foot treadle located within easy reach of the operator's right foot, leaving his hands free to handle the work.

A master push button station for starting and stopping the motors is

(Turn to page 212, please)

Landis Pipe Threading and Cutting Machine

The Landis Machine Co., Inc., Waynesboro, Pa., has added a 13⅜-in. pipe threading and cutting machine with receding chaser die head and leadscrew to their well-known line of pipe machines. It has a capacity of 4½ in. to 13⅜ in. O.D. and will generate a tapered pipe thread of any length up to and including 8 in. and any tapers of ¾ in. per foot and less.



The receding chaser feature reduces the cutting strain on the chasers to that required for a straight thread of like diameter and pitch, and insures superaccuracy and an exceptional finish. It also permits the use of a very narrow chaser which lowers the initial chaser cost approximately 50 per cent, adds materially to the life of the chasers between grindings and otherwise effects a saving.

The die head has a universal adjustment for size. In addition there is a micrometer adjustment for the final setting. Each graduation on the micrometer dial gives a variation of .001 in. in diameter.

The die head is a two-cut head and can be used for roughing and finishing. The roughing and finishing cuts are controlled by the same receding mechanism. The finishing cut can be made without any change in the diametrical adjustment.

PROTECT YOUR PROFITS

—by knowing that your gears meet specifications

Avoiding the rejection of just one lot of gears, particularly if you are making them for resale, will pay handsome dividends on the purchase of a FELLOWS RED LINER.

One manufacturer* recently informed us that he had had a large quantity of gears returned with his customer's statement that they did not meet specifications.

The loss on this one order alone would have paid for several RED LINERS.

There is little or no practical value in inspecting the individual elements of gears—tooth shape, spacing, etc. Your inspection should be such that all errors can be checked *in combination*. Only in this way is it possible to be certain that they will function properly.

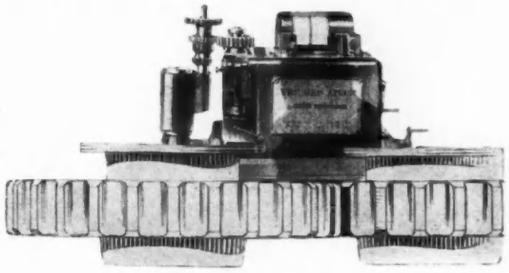
The RED LINER not only automatically inspects all elements at one setting, but makes a permanent record, which is your guarantee that specifications have been fulfilled.

No modern gear department should be without a RED LINER. Ask for copy of booklet No. 11.

THE FELLOWS GEAR SHAPER CO.
78 River Street, Springfield, Vermont
616 Fisher Building, Detroit, Michigan

On this modern inspection machine the human element is reduced to the minimum, so that you are assured that specifications will be fulfilled.

Fellows "Red Liner" INSPECTION



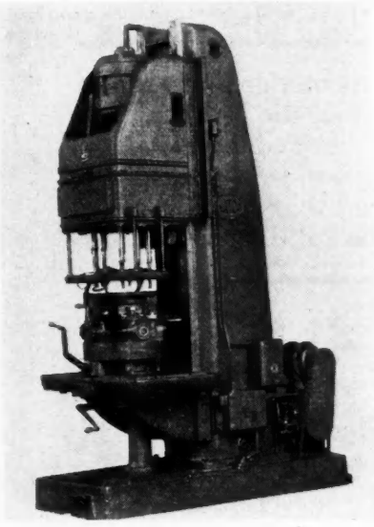
*[*This manufacturer has decided to protect future profits and has ordered a RED LINER.]*

FELLOWS
GEAR SHAPERS

NEW DEVELOPMENTS
Automotive Parts, Accessories and Production Tools

built into the table at the front of the machine. The starting button is provided with a guard to prevent accidental contact.

Oil is the medium used in the hydraulic system. Feed is supplied by an Oilgear QS pump using a slightly modified control valve. This is a high pressure plunger type volumetric pump having a pressure of 1000 lb. per square inch. No low



pressure pump is provided for rapid traverse. The high pressure pump is utilized at its maximum capacity for this work. In order to increase the rapid traverse rate, a differential control system is used.

An oil reservoir, cast as a separate part of the machine, is mounted on the base at the rear of the column. The Oilgear pump is mounted in the side of this reservoir and driven through two well guarded V-belts by a 3 hp. motor which is mounted to a bracket on top of the reservoir. The motor bracket is made adjustable to take up slack in the driving belts.

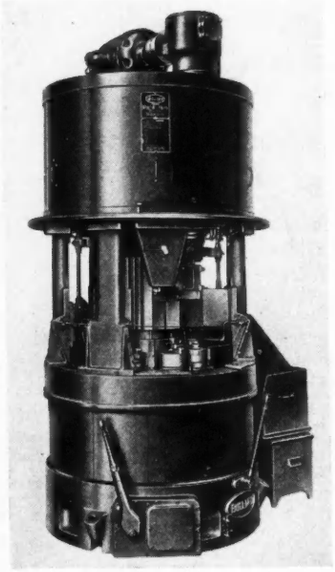
The motions of the head are controlled by a sliding valve with a rapid forward, feed, reverse and stop. The valve is mounted on the side of the pump. The movements of the valve are controlled by a trip mechanism of the load and fire type. This trip mechanism is mounted on the right hand side of the column and is linked up with a foot treadle at the front of the base.

Bullard Type C Mult-Au-Matic

A new Mult-Au-Matic designed primarily for fast work has been announced by The Bullard Co., Bridgeport, Conn.

The Type "C" Mult-Au-Matic is built in six and eight spindle models. Five or seven stations are for the machining operations in process, while simultaneously at the remaining station the work is being chucked. At the respective work stations there may be mounted a variety of boring, drilling, and reaming tools in conjunction with facing and turning tools. This arrangement, while simple in function, covers a wide and complete range of operating conditions.

Through the combination of main head and tool column heads at each of the work stations, it is possible to approach the smaller work from different directions for concentrated operations at close quarters and still maintain in the retired position sufficient room for easy tool setting.

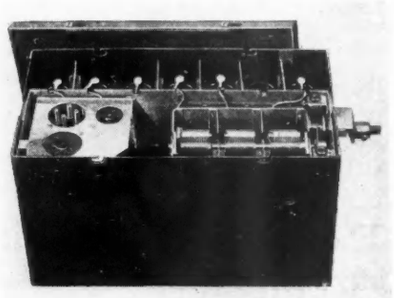


This machine is unique in that tools, such as core drills, reamers, and boring bars, are mounted directly on the main column which provides a uniform feed at all work stations.

Motor drive is by a constant speed motor, AC or DC, 1760 r.p.m. under load. The 6-spindle machine has a 20 hp. motor, the 8-spindle, 25 hp. Diameter of the machine is 55½ and 65¾ in. respectively.

Bosch Automobile Radio

Among the items of automobile equipment exhibited for the first time at the national automobile shows this year is a superheterodyne motor car radio receiver manufactured by the United American Bosch Corporation of Springfield, Mass. One of the special features of the set (which is known as the American Bosch 9-20) is a device called a Magmotor, designed to serve as a B-battery eliminator. It is essentially a rotary converter with permanent magnetic fields, drawing the current for its operation from the car battery but requiring no such current for field excitation. The converter is contained in a compact metal case measuring 10 by 4¾ by 5¼ in. The manufacturer does not recommend the use of the Magmotor on cars on which the



electrical generating system does not possess sufficient reserve capacity to furnish the small additional current required for its operation. Ball bearings, mounting in rubber cushions within its case, and precision construction are said to make the Magmotor noiseless in operation. The 9-20 set can be operated also with B batteries, three 45-volt batteries of the heavy-duty automobile type being required in that case.

This new automobile receiving set is said to have five times the sensitivity of the former American Bosch model. This improvement is due to the adoption of the superheterodyne principle. Seven of the new type tubes specially designed for automobiles are used, including one that serves as a diode-triode.

Among other advantages claimed for the new set are great selectivity, full automatic volume control, and tone quality resembling that of the better household radios. The improved electrodynamic speaker is contained in a wooden box which supports only its own weight, the frame of the speaker itself being mounted rigidly on the bulkhead of the car to prevent transmission of annoying noises. Roof-type antenna, which are now being installed in many cars, are made use of.